

CALIFORNIA  
ENERGY  
COMMISSION

# WIND PERFORMANCE REPORT SUMMARY 2000-2001



**STAFF REPORT**

December 2002  
P500-02-034F



Gray Davis, Governor

# **CALIFORNIA ENERGY COMMISSION**

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## **ACKNOWLEDGEMENTS**

Acknowledgements are due to all those who have helped establish the Wind Performance Reporting System. The WPRS report was developed by the California Energy Commission in conjunction with the state's wind industry, American Wind Energy Association, the Department of Energy and is under the direction of Dora Yen, Technical Lead for Wind Energy Resources in the Public Interest Energy Research Renewable Research and Development Group.

Special appreciation is extended to George Simons, Elaine Sison-Lebrilla, Pramod Kulkarni and Suzanne Korosec for providing review support and information in compiling the wind information.

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## CHAPTER 1 INTRODUCTION

In 2000, California experienced one of the most devastating man-made storms in history. Dubbed the “perfect storm” of the West, the California energy crisis was a culmination of decisions by policy makers and actions by the electrical industry that predate the actual industry deregulation. The electricity market restructuring became the most visible culprit for California’s blackouts and sky-high price hikes, which were aggravated by the shortage of natural gas capacity, rapid urban development, lack of new generation capacity, the unusually hot summer and cold winter, and the de-emphasis on energy efficiency programs. California ratepayers are still dealing with the repercussions of an unstable and deficient market structure. To address these deficiencies, the Governor has developed an energy plan and proposed numerous legislative bills to stabilize the market volatility and reduce risks in the future. Others are drawing upon the “lessons learned” and pushing for solutions to reshape the electricity sector.<sup>1</sup> Throughout this report, we refer to the Commission’s annual report as a summary of the operators reports, submitted to the Commission, as a performance reporting system of wind operators.

The outlook for California’s electricity market, however, is not all gloom. California has had a strong track record in developing innovative energy efficiency and renewable energy programs. By developing long-term grid reliability strategies and reinvesting in these strengths, California can more efficiently harness the renewable potential and provide protection from future energy crisis. In the past, innovative efficiency programs and standards have helped curb electricity demands and provided savings of over 10,000MW, one-fifth of California’s peak demand.<sup>2</sup>

In fact, strong consumer education and energy efficiency programs are continuing to provide positive energy saving results. As demonstrated during the rolling blackouts, the Department of Consumer Affairs’ public awareness programs were key to reducing demand and preventing further blackouts. In addition, state sponsored renewable energy initiatives are helping to spur renewable energy growth and technology improvements. Including the Commission’s Public Interest Energy Research (PIER) program, in conjunction with the federal government’s Wind Powering America program and production tax credit (PTC) extensions.

California has one of the most diverse electricity supply systems in the nation, with an abundant mix of natural resources such as wind, biomass, geothermal, hydroelectric, and solar. California still leads the nation in wind generation capacity with over 60% of the installed wind capacity. As one of the most economical and fastest growing sources of utility scale power in the state, wind park operators are now looking for more advanced and reliable turbine technologies, sophisticated monitoring and resource management tools to help them optimize production. New technologies have driven the cost of wind-generated electricity down to values now comparable to natural gas at about 5 ¢/kWh. In the future, wind generated electricity is predicted to play a major role in providing clean, fast, and affordable electricity. The detailed data provided by reports such as the WPRS

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<sup>1</sup> California Energy Commission, *California Energy Outlook*, Staff Report, September 2001.

<sup>2</sup> California Energy Commission, “*Public Funding for Energy Efficiency Programs in California: 1998 to 1999*,” P400-99-012.

are important for tracking growth and providing developers a prospective on industry performance, development trends and insight on future needs for the industry.

## **CHAPTER 2 BACKGROUND ON WPRS**

### **Wind Performance Report Summary Program Scope**

California law requires the California Energy Commission to serve as a central repository in state government to collect and disseminate information on energy supplies.

Since January 1985, WPRS regulations have required all California wind operators with projects rated at 100 kW or more to provide quarterly wind performance reports. The WPRS reports filed by operators include information such as actual energy production and related project information. In addition, all California power purchasers are required to file quarterly reports documenting power purchases from wind operators. The Commission compiles, evaluates these data, and documents findings in annual reports on wind industry performance in California. The report is one of the most comprehensive statewide databases of wind operator information. Wind energy related information and archived WPRS documents since 1996 may be found on the Commission website, [[www.energy.ca.gov/](http://www.energy.ca.gov/)].

### **Reasons for Wind Performance Report Summary Regulations**

The Commission's wind program was initiated in 1977 and later expanded in 1978 with the passage of California Assembly Bill-2976 authored by Assemblyman Henry Mello. The Mello bill required the Commission to implement a state wind energy program to expedite the commercialization of utility-scale wind turbines. The Commission became responsible for assessing wind resources throughout California, operating a public wind information center, testing wind turbines technologies, and conducting research to support development of large-scale prototype wind turbines.

With exponential growth in wind energy during 1981, the Commission and the American Wind Energy Association (AWEA) recognized the need for turbine output performance and other technology-related information. Efforts by these two organizations led to adoption of Wind Project Performance Reporting System (WPRS) regulations in 1984.

WPRS regulations were instituted for many reasons. First, the industry, investors, financial community, and government agencies need actual performance data to better evaluate the status of wind technology and necessary improvements. In 1985, wind project financing was primarily venture capital from private investors willing to take a substantial risk on the technology due to available tax benefits.

Since the tax credits expired, projects have focused on revenues from power sales and placed greater reliance on conventional project financing from institutional lenders and foreign investors. The WPRS data also were needed to establish performance credibility with these new sources of financing. Second, wind performance data provide a better understanding of the role wind resources can play in meeting California's energy needs. Last, the WPRS provides the public with an open and objective source of information

about wind energy technologies. California's WPRS report still remains the only statewide compilation of wind resources in the nation.

### **Information Provided by Wind Performance Report Summary Reports**

The operator reports include the following information for wind projects in California, rated at 100 kilowatts (kW) or more, that sell electricity to a power purchaser: turbine manufacturers, model numbers, rotor diameter, and kW ratings; the number of cumulative and new turbines installed; the projected output per turbine (no longer reported after 1995); the output for each turbine model; and the output for the entire project.

The Commission's report is compiled from monthly reports submitted by project operators and public utilities. The Commission staff uses these data to analyze wind project performance and industry production and capacity trends. The annual report also contains data summary tables reflecting performance statewide and by resource area; turbine size, type and origin; manufacturer; and project operator. Note that totals expressed in tables and figures may not equal 100 percent due to rounding.

Since 1985, the Commission has collected, documented, and evaluated data submitted by operators and utilities to comply with WPRS regulations. Extensive empirical data collected and disseminated by the Commission are used by numerous groups-in industry, utility, investor, manufacturer, government, and R&D-use the Commission's report to evaluate the performance and relative benefits of wind technology.

### **Information Not Provided by Wind Performance Report Summary Reports**

The wind operator reports do not provide information on every wind energy project in California. The absence of a project from WPRS reports typically indicates that the project is not selling any power or is rated less than 100 kW. Non-operating wind projects are not required to report to the Commission. Other unreported capacity includes turbines that do not produce electricity for sale, such as turbines installed by utilities, government organizations, and research facilities. Additional unreported capacity results when operators fail to file. Installed capacity for these operators cannot be confirmed and only kWh production verified from utility reports is included in WPRS reports. In addition, the wind operators' reports cannot account for the impact turbine age has on performance because turbines are often reported in groups combining old and new machines.

### **Considerations and Limitations Using Wind Performance Report Summary Data**

Although many valuable observations about California's wind industry can be drawn from WPRS data, it is important to recognize some major limitations:

1. While the Commission collects and reports WPRS data in its annual report, the wind industry cannot be evaluated without the considering the collective data from several years because the available wind resource vary from year to year depending on weather conditions.

2. The data reported by qualifying facilities and utilities and/or other sources may not compare directly because the wind industry still does not employ a standardized turbine rating system. Turbines are tested under different conditions and rated at widely varying miles-per-hour specifications. Whenever standard formulation is used to compute values, the equations and inputs are described.
3. Operator or manufacturer performance may not be accurately represented in the report when old and new turbine data are grouped together. The analysis of wind data reported since 1985 confirms that newer equipment typically
4. Performs more efficiently and reliably than older equipment.
5. Performance data contained in WPRS reports do not reflect other important variables that should be considered. These variables include cost per kilowatt, operation and maintenance costs, durability of the system, and quality of the site's wind resource.

## CHAPTER 3 WPRS DATA COMPILATION ISSUES

The Commission has continued to collect WPRS data on a quarterly basis since 1985 and has published annual WPRS reports from 1985-1995. With restructuring and resource demands, the PIER renewables research and development group (R&D) assumed responsibility and resumed compiling and evaluating the WPRS data in 1999. The 1996-1999 summary report was produced in 2000.

This report provides a summary of years from 2000 and 2001. The most updated information on operational wind projects, operators, manufacturers and contacts are provided for 2001. The R&D staff will continue its efforts to compile WPRS data, and future WPRS reports will resume on an annual basis. The WPRS reports will be made accessible via the Commission website. The Commission is also working on developing an interactive web-based archive (to include data since 1985), which is expected to be available late 2003.

**Validation** Originally, quarterly summary reports from the utilities were to be used to validate each operator or qualifying facility's (QF) quarterly data for capacity in kilowatts (kW) and electricity production in kilowatt-hour (kWh). However, numerous inconsistencies appeared in the data from these sources making it difficult to validate the two. Discrepancies often existed between utility and QF data for installed capacity and reported production. Upon further investigation, the R&D staff determined that the utilities provide capacity data for only those operators who have a power sales agreement. Figures in this report are based on the contracted maximum capacity and are not consistently updated for changes due to re-powering or to an increase or decrease in actual site capacity. In addition, some sites failed to file quarterly data.

Thus, discrepancies exist between QF site installed capacity reports versus utility summary reports. In some cases, a direct comparison of individual QF production numbers was also not possible because data for more than one project were combined under a single utility contract, making it difficult to verify and track individual project output figures. Whenever possible, individual QF site data are now used since the data proved to be more consistent and traceable.

**Failed to File** Utility quarterly reports inform the Commission staff of all wind farm operators with projects rated at 100 kW or more that sell power to utilities. These operators are required to submit monthly data reports for the WPRS. However, from 2000-2001, many wind operators failed to file. They or their managing facility operators were individually contacted, and a request to update their information was made. Operators who sold power and were contacted but did not submit reports are noted as "failed to file" in the charts and tables.

**Reports with Missing Data** Some project operators filed incomplete WPRS reports or reports that did not follow prescribed formats. The predominant missing data item was projected quarterly output per turbine. (See Changes to WPRS Reporting). Some wind operators reported only annual output estimates or combined data for several projects into one report. The Commission requested the project operators to update their

reporting format. The Commission staff continues to work with and assist project operators by simplifying the reporting process ensure data consistency and completeness.

**Changes to WPRS Reporting** Several changes were implemented to simplify the reporting and data collection process during this reporting period. Project operators were notified and sent a new reporting format for each facility, which is electronic and a single page. The new format replaced the old form and now includes monthly reports. The new format also eliminated some data fields that are currently not reliable enough to track. Specifically, the projected data are not requested at this time but may be reinstated at a later date once forecasting/predictive capabilities have been improved. The majority of project operators have converted to electronic reports that conform to the most recent WPRS monthly reporting format. (Appendix C)

## **CHAPTER 4. CALIFORNIA WIND RESOURCES AREAS & SITES**

The wind resource and sites map in the following pages include the geographical location of major wind development areas, wind resources, and small wind turbine sites in California by county.

### **Large Wind Generation**

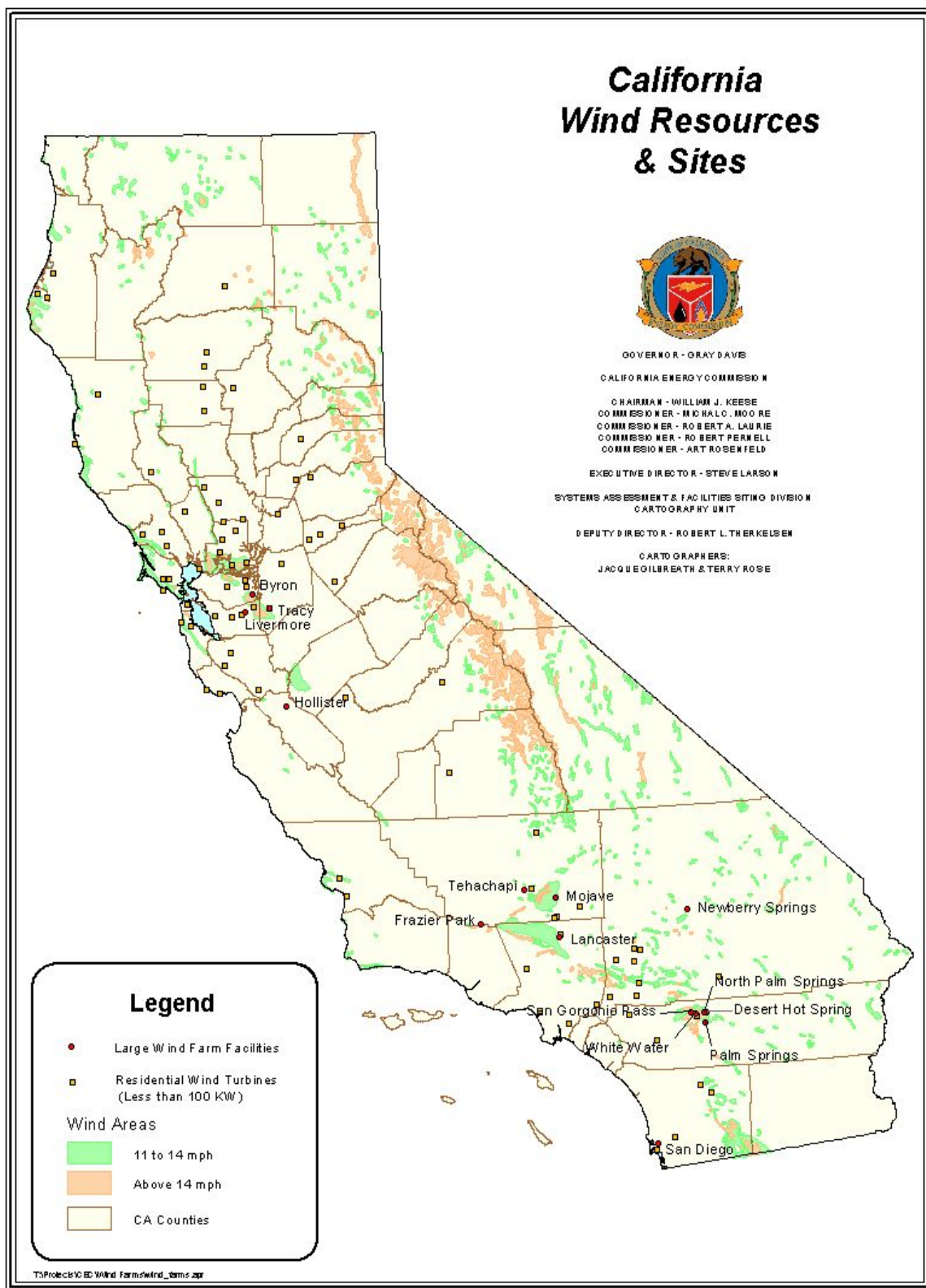
During the report period from 2000-2001, wind performance data were received from large wind operators with projects located in the following resource areas but are by no means limited to only these resource areas:

- Altamont Pass
- Pacheco Pass
- San Geronio Pass
- Tehachapi Pass
- Solano (Solano County)

### **Small Wind Generation**

This year is the first one that small wind turbine statistics are being included in the WPRS report. With AB1207 now in effect, steady growth in small wind generation is expected. The baseline data provided here will provide some measure of growth in the years to come. Small wind turbine resources generally comprise small turbine facilities of operations below 50kW. Because private small turbine owners are not required to report under WPRS regulations, the data are known for only grid-connected small turbines and are compiled from a variety of sources including California's Buy Down program, AWEA's small turbine case studies, and manufacturer's websites. Small wind turbine generation accounts for approximately 718kW and is spread across 36 counties in California.

## CALIFORNIA WIND RESOURCES MAP



Source: California Energy Commission, [[www.energy.ca.gov/](http://www.energy.ca.gov/)].

## SMALL WIND TURBINES:

### Range 1-10kW Turbine Sizes

Turbine Model:	SouthWest Windpower
Turbine Size:	400W
Rotor Diameter:	3.8 ft
Number of Blades:	3
Tower Height:	14m (45ft)



### Range 1-10kW Turbine Sizes

Turbine Model:	SouthWest Windpower
Turbine Size:	900W
Rotor Diameter:	7 ft
Number of Blades:	3
Tower Height:	14m (45ft)



### Range 1-10kW Turbine Sizes

Turbine Model:	SouthWest Windpower
Turbine Size:	1kW
Rotor Diameter:	10 ft
Number of Blades:	3
Tower Height:	9m-24m (30-80ft)



### Range 1-10kW Turbine Sizes

Turbine Model:	SouthWest Windpower
Turbine Size:	3.2kW
Rotor Diameter:	15 ft
Number of Blades:	3
Tower Height:	9m-24m (30-80ft)



### Range 1-10kW Turbine Sizes

Turbine Model:	Bergey
Turbine Size:	10kW
Rotor Diameter:	23 ft
Number of Blades:	3
Tower Height:	30m (100ft)



### Range 11-30kW Turbine Sizes

Turbine Model:	Boreas
Turbine Size:	20kW, 30kW
Rotor Diameter:	46ft
Number of Blades:	2
Tower Height:	40m-70m (130ft-230ft)



### Range 11-30kW Turbine Sizes

Model	23 (Jacobs)	23 (Jacobs)	26 (Jacobs)	26 (Jacobs)	29 (Jacobs)
Tower Height	24m-36m (80 - 120 ft.)	24m-36m (80 - 120 ft.)	24m-36m (80 - 120 ft.)	24m-36m (80 - 120 ft.)	24m-36m (80 - 120 ft.)
Rotor Diameter	23 ft.	23 ft.	26 ft.	26 ft.	29 ft.
Swept Area	415 sq. ft.	415 sq. ft.	530 sq. ft.	530 sq. ft.	660 sq. ft.
# Blades/Type	3/ wood	3/ wood	3/ wood	3/ wood	3/ fiberglass



### Range 40-50kW Turbine Sizes

Turbine Model:	AOC 15/50
Turbine Size:	50kW
Rotor Diameter:	49.2ft
Number of Blades:	3
Tower Height:	24m (80ft)



### Range 60-70kW Turbine Sizes

Turbine Model:	Windmatic
Turbine Size:	65kW
Rotor Diameter:	34ft
Number of Blades:	3
Tower Height:	25m (84ft)

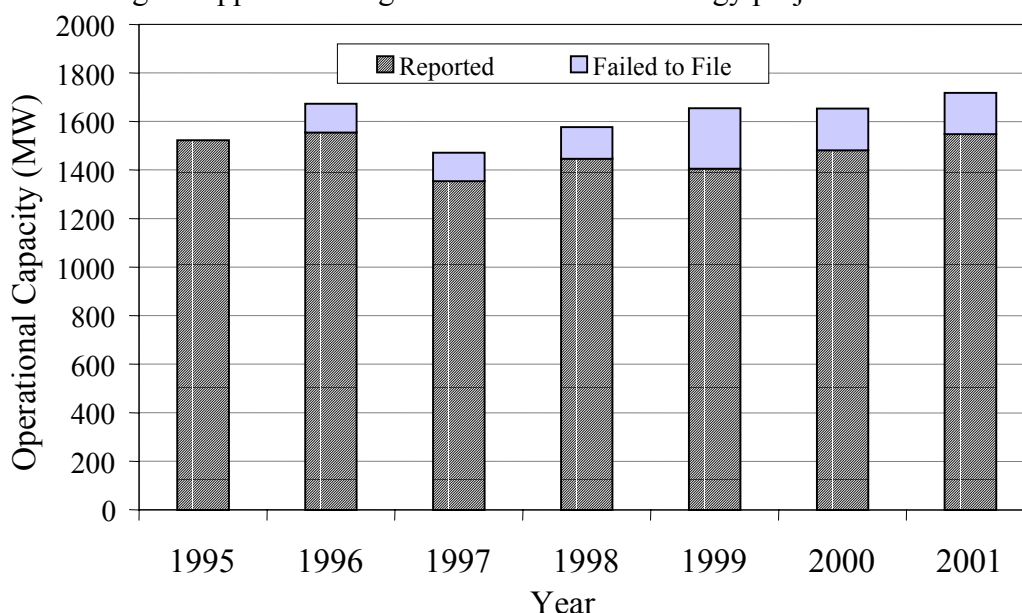


## CHAPTER 5 DATA SUMMARY

### Industry Performance

In this section, graphs refer to industry performance tables, which are summarized in Chapter 6 from 2000 to 2001. As previously reported, these tables are based on individual operator's (QF-qualifying facility) data reported to the Commission. Thus, in some cases, the data presented may not correspond directly to numbers provided by the utility data summaries for reasons indicated in Chapter 3.

**Total Capacity.** During the fourth quarter of 2001, the QF's reported 1,549 MW as operational by qualifying facilities, as shown in Figure 5.1. In accounting for those facility operators who "failed to file" within the given period, the Commission estimated their operational capacity to be 1,720 MW for 2001. From 1997 to 2001, operational capacity based on operator data showed a general increase. This trend was due in part to new project development and performance improvements on new turbines. Moderate growth in wind generation throughout 2000 was partly due to re-powering efforts that got underway before the energy crisis as well as to various state incentive programs supporting renewable energy development. Specifically, AB1890 and SB90 continue to provide funding to support existing and new renewable energy projects.



**Figure 5.1. Total operational capacity (MW) from 1995-2001**

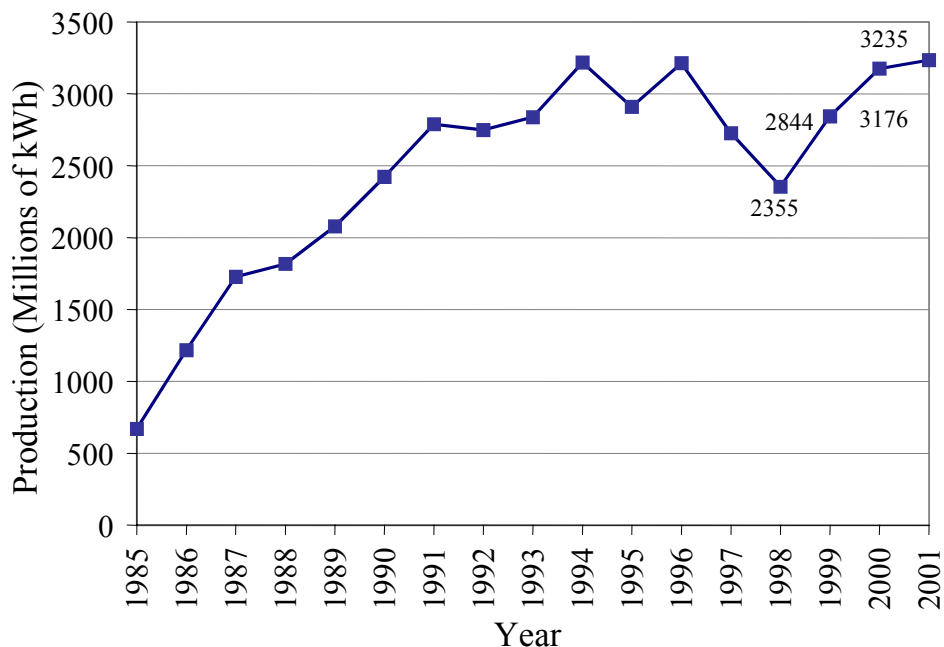
Table 1 shows how the wind energy capacity changed from 1995-2001 in the state. Since 1997, installed capacity has increased generally. Re-powering activities accounted for much of the capacity changes in the late 1990s, but despite the instability in the California electricity market, new developments are still underway in 2000. In 2001, over 65 MW of new capacity was installed at SeaWest's Mountain View facilities, which began generation in the third quarter (Section 7.2). Note, it is difficult to discriminate between re-powering and new capacity unless the facility is a newly added facility (i.e., other than the standard offer, SO4 sulfate contracts).

In general and in the context of this report, re-powering refers to the physical replacement of older turbines with new, more efficient turbines. This definition differs from the traditional definition, which refers to refurbishing existing turbines with new blades, generators, or other components to increase the capacity and output. Now, turbines are generally replaced versus refurbished.

**Table 1. Wind energy capacity change from 1995-2001**

Year	Capacity Change (MW)
1995	1
1996	-28
1997	-164
1998	201
1999	65
2000	1
2001	68

**Electricity Output** In 2001, the California wind industry reported more than 3,200 million kWh of electricity output, as depicted in Figure 5.2, approximately 1.5% of the state's electricity. Combining the numbers from those that "failed to file," the industry output exceeded 3,500 million kWh. With an average California household using 6,500 kWh of electricity per year, 3,200 million kW wind generation provides electricity sufficient to power over 500,000 homes for a year.

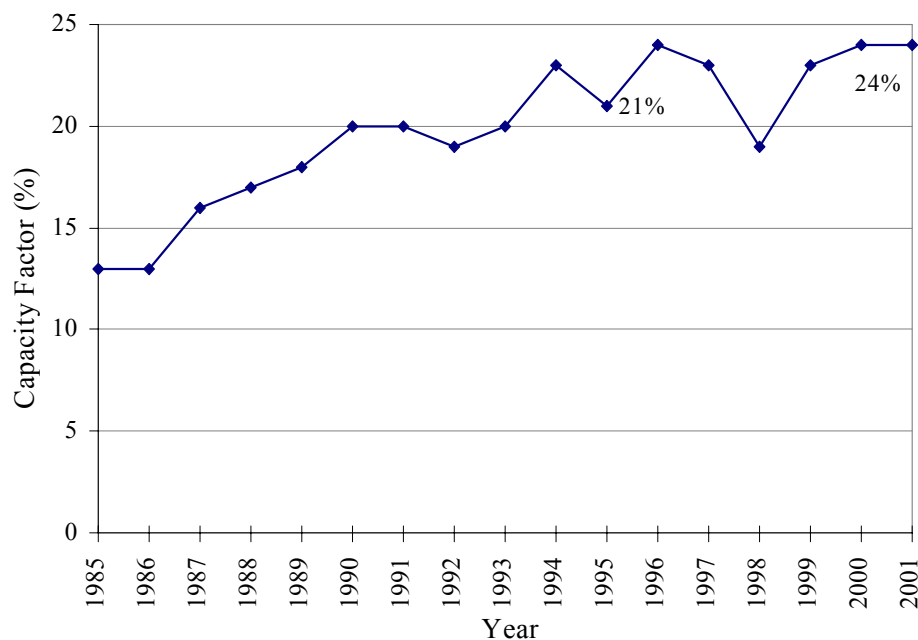


**Figure 5.2. Statewide wind energy production for 1985-2001 in millions of kWh**

**Capacity Factor** The capacity factor (CF) is a measure of efficiency, which is typically defined as the ratio of actual energy output to the amount of energy a project would produce if the project operated at full rated power for 24 hours per day for a year. Although variations exist with wind turbine ratings based on widely differing test conditions, procedures and non-standardized miles-per-hour specifications, the capacity factor is still considered a strong indicator of wind project performance. Voluntary standards for testing wind turbines, however, have been developed by the American Wind Energy Association.

The annual CF is typically computed based on annual production figures and turbine capacity for the year, or the CF can be computed as the average of quarterly capacity factors calculated for each group of turbines reported in that quarter. With the WPRS quarterly data available from operators, only operating turbines are used to calculate the CF so that performance results are not skewed by non-operational capacity. Although new turbines are not likely to operate for the entire quarter installed, this method provides the most consistent method for calculating CF without randomly interpreting when new turbines are operational or non-operational.

As shown in Figure 5.3, the resulting statewide annual CF is holding strong, averaging over 20%. Despite the turbulent industry restructuring and shakeout period throughout the 2000-2001 period, the 3% increase in CF from 1995 and 2001 is a good indicator that overall efficiency is steadily improving. Whether this level of efficiency can be maintained or perhaps increased remains to be seen in the coming years, as more advanced turbines continue replacing older models. Examining the summarized data tables in Chapter 6 for the state and by individual resource areas, the CF improved overall in 2001. The CF achieved by many California wind projects continues to exceed 30% during the high wind seasons (second and third quarters).

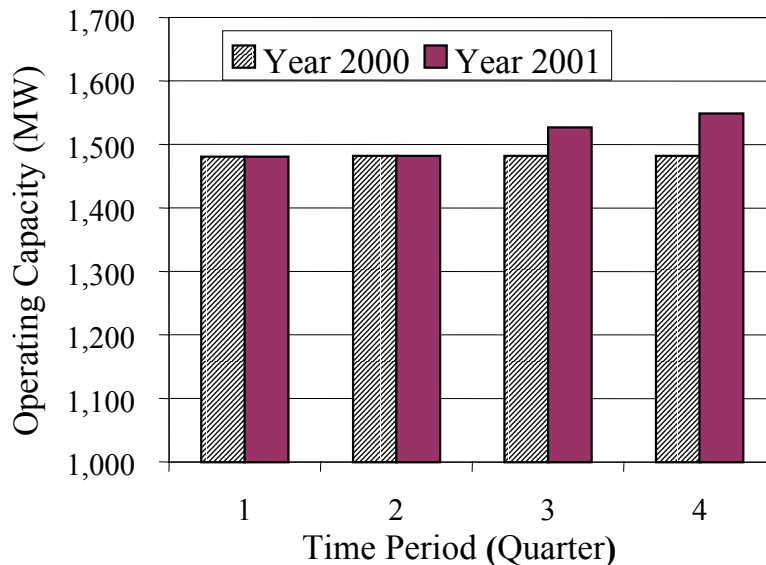


**Figure 5.3. Statewide capacity factors from 1985-2001.**

## Production and Capacity Trends

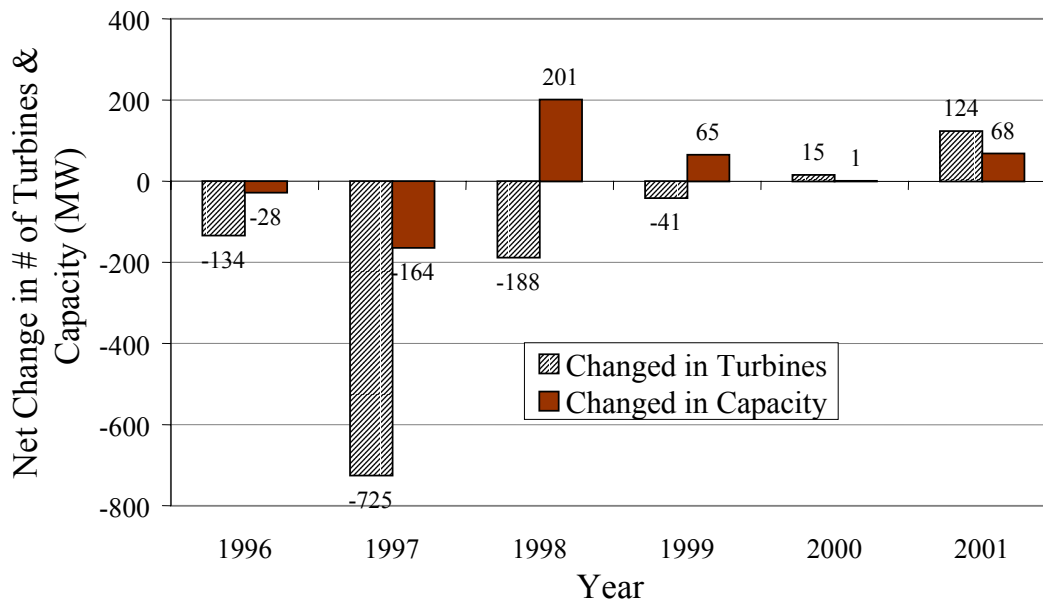
### Statewide

In 2001, 68 MW of new capacity was installed in California, a significant increase compared to the 1 MW in 2000. Nearly 67 MW of new capacity were installed in the San Geronio wind resource area, with some re-powering accounting for about 1 MW in the Altamont. Figure 5.4 depicts the trends in capacity from 2000-2001 by quarter. Although facilities that “failed to file” were not included, the increasing trend in capacity throughout 2001 contrasts with the steady decrease from 1995 to 1997.

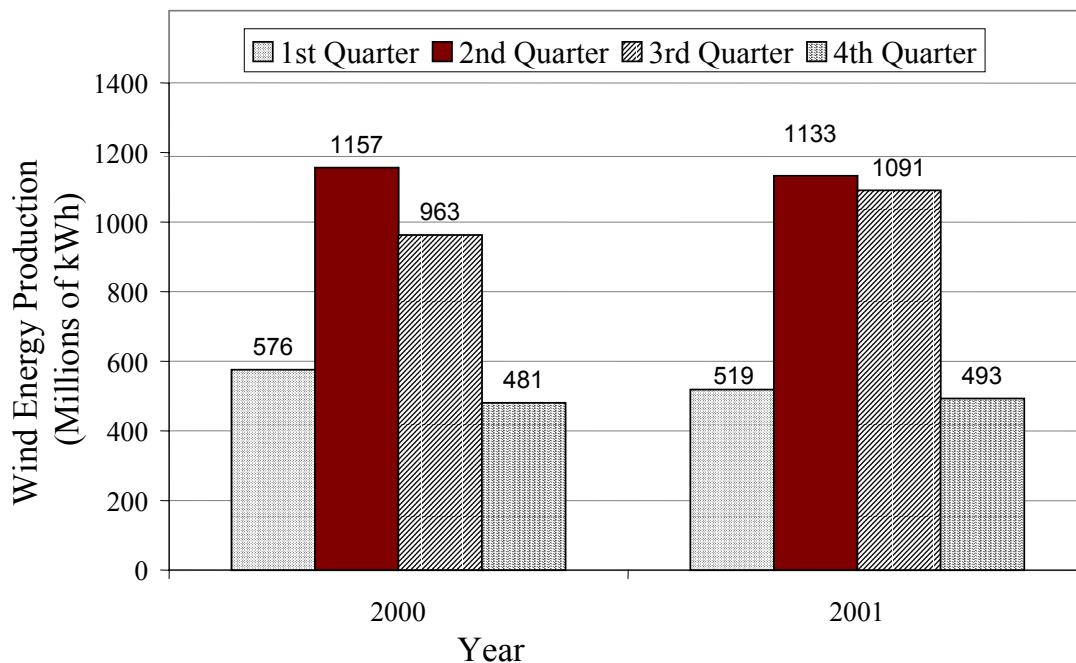


**Figure 5.4. Statewide capacity from 2000-2001 by quarters** Note: values do not include “failed to file” facilities

As summarized in Figure 5.5, from 1996 to 1997, capacity declined noticeable (-164 MW) as well as number of turbines (-725 turbines), due to attrition of older turbines, cannibalization for parts and shutdown of facilities in 1997. In the second half of 1998, nearly 201 MW of capacity were back on-line, with most of the activity occurring in the Tehachapi wind resource area. In Tehachapi alone, over 600 turbines were re-powered, or brought back on-line, in 1998. Re-powering efforts, with larger capacity and more efficient turbines, occurred throughout the late 1990s and early to the new millennium, resulting in the positive net capacity change despite a steady drop in the total number of turbines. (Figure 5.5)



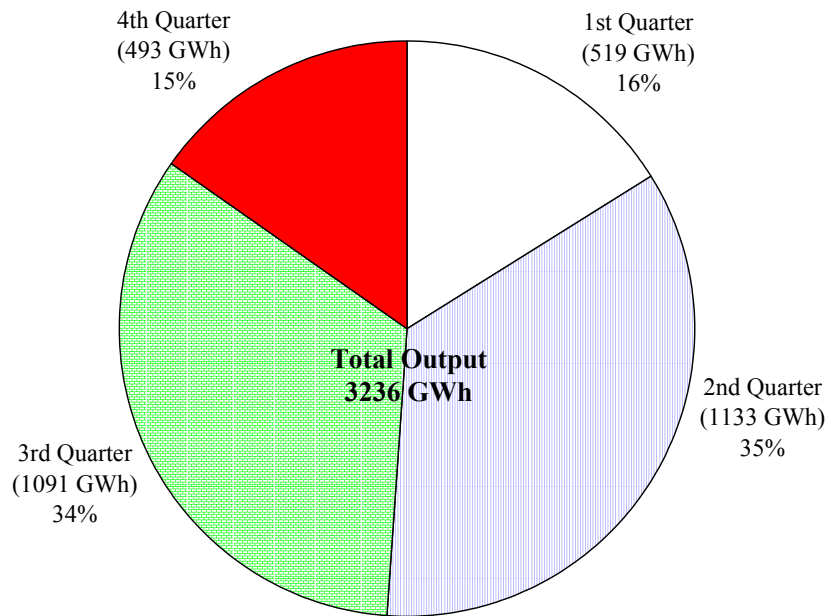
**Figure 5.5. Change in # of turbines and capacity in MW from 2000-2001**



**Figure 5.6. Breakdown of statewide wind energy production by quarters**

Quarterly wind output trends from 2000-2001 are shown in Figure 5.6. These trends were consistent with the typical California wind resource profiles: low winds at the beginning and end of the year and high winds during spring and summer when the warmer seasons create a natural draw of cool coastal air into hot inland valleys and deserts. The data indicated that almost 70% percent of all annual output was produced in the second and third quarters of 2001 (Figure 5.7). This figure corresponds well with California's peak demand for electricity during summer the months. Quarterly CF was consistent with the previous California wind resource reports. The statewide CF for

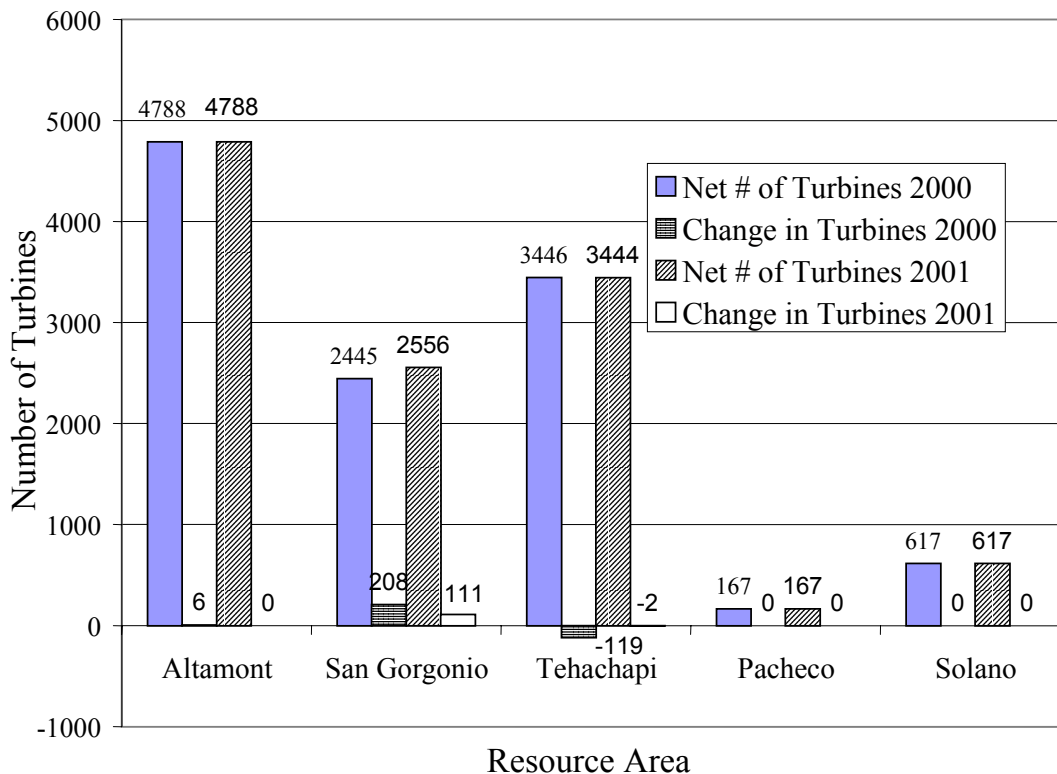
2001 were 16%, 35%, 34%, and 15% respectively for the first, second, third, and fourth quarters.



**Figure 5.7. Statewide wind energy production per quarter in 2001 (GWh or millions of kWh)**

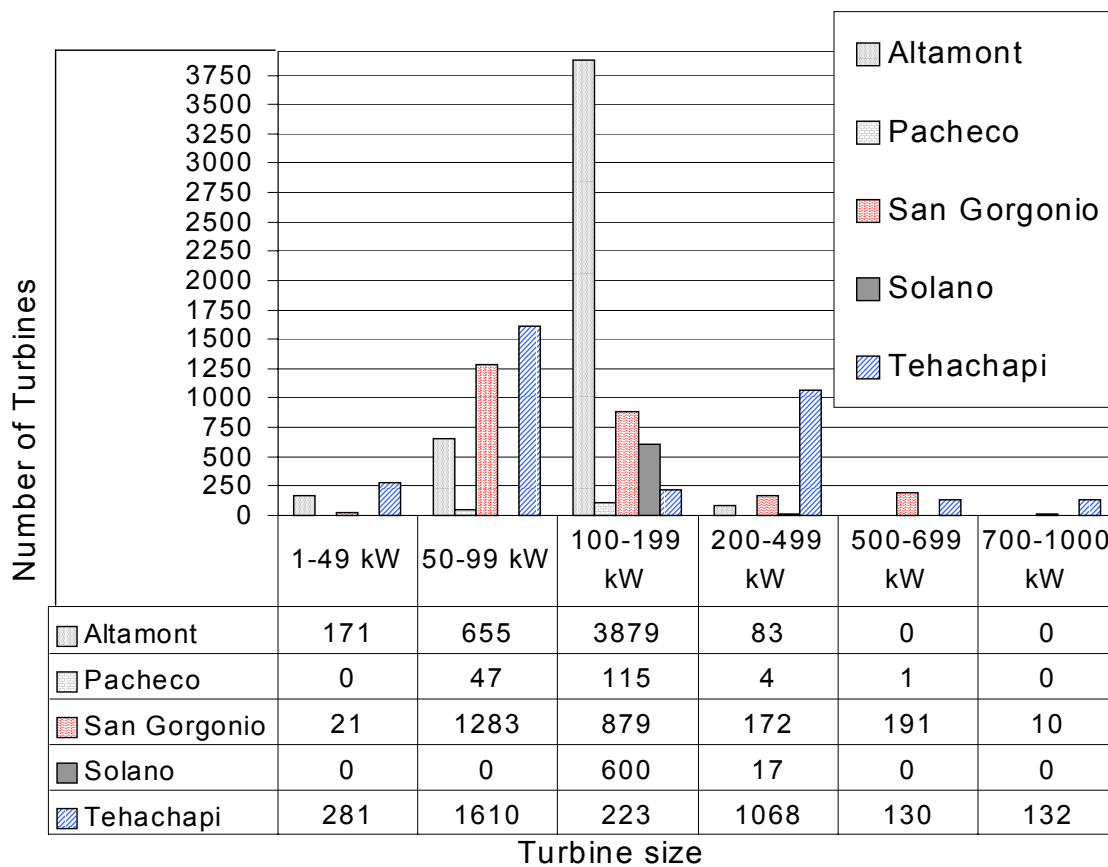
#### **Resource Area**

Although wind project operators from five different resources areas in California reported to WPRS, three primary regions account for more than 10,700 of California's wind turbines. These regions are Altamont Pass (east of San Francisco), Tehachapi (southeast of Bakersfield), and San Gorgonio (east of Los Angeles), as shown in Figure 5.8. The topography of the primary wind resource areas in California consists of narrow mountain passes leading into hot valleys or desert regions. These three regions account of nearly 95% of all of California's wind generation and approximately 11% of the world's wind-generated electricity in 2001. Figure 5.9 shows the distribution of turbines by resource areas.

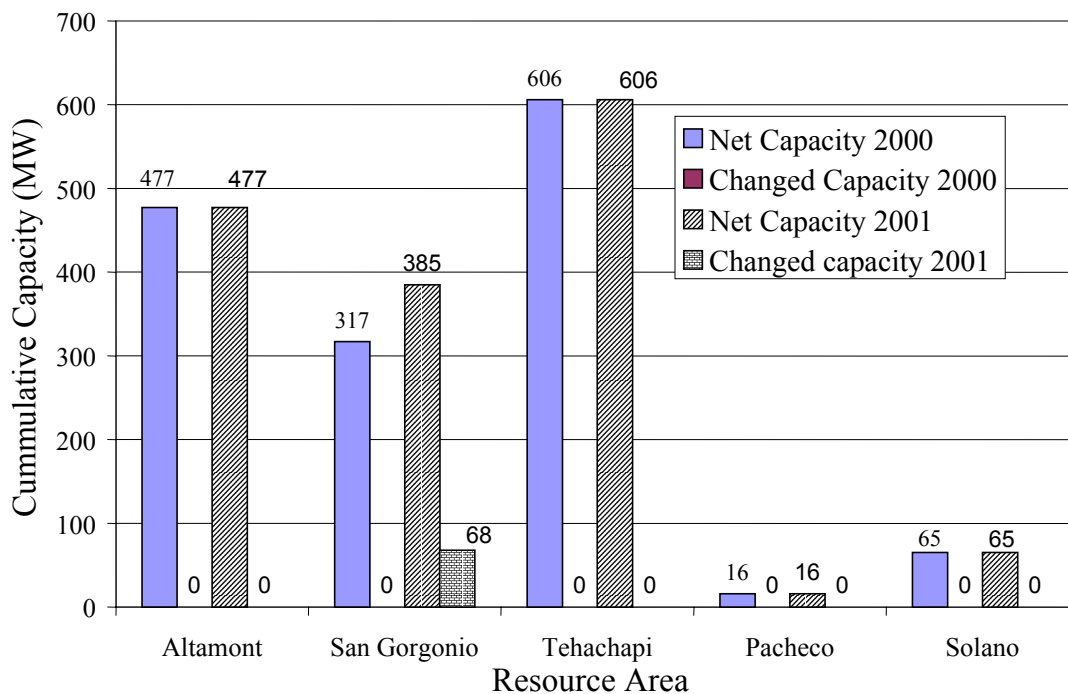


**Figure 5.8. Number of turbines and the change by resource area for 2000-2001**

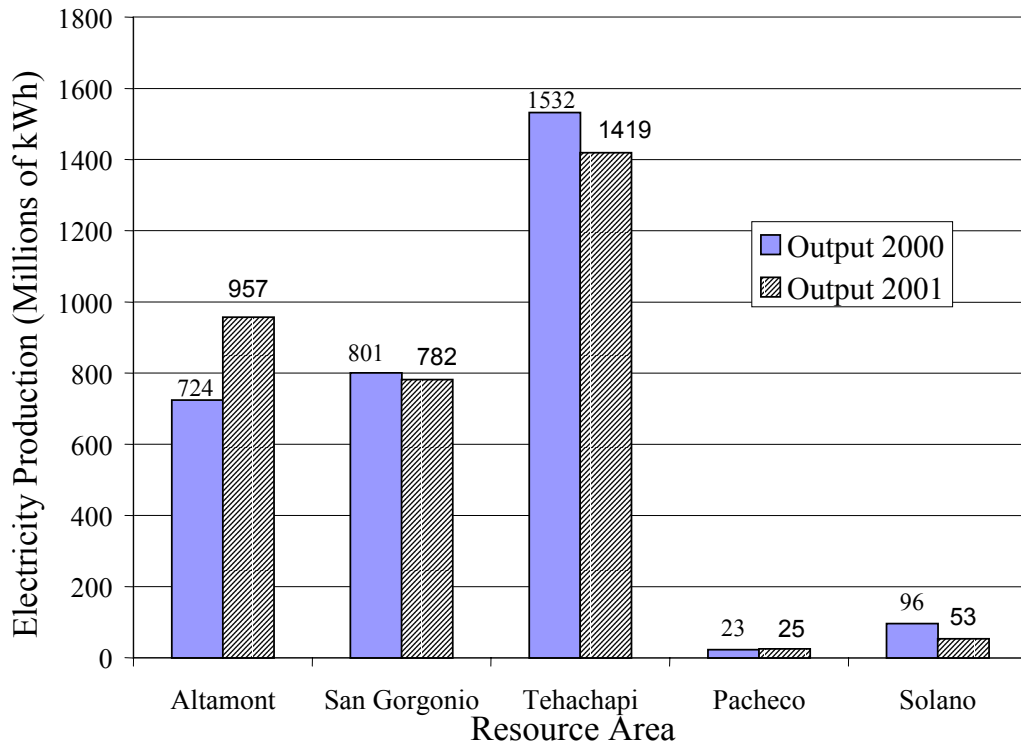
In 2001, among the five regions identified, the Tehachapi area accounts for nearly 39% of all capacity, 31% in the Altamont, 25% in San Gorgonio, 1% in Pacheco, and 4% in Solano. (Figure 5.10a) The quarterly production output trends for each region is compared in Figure 5.10b for 2001. Figure 5.11 shows the change in energy density or generation potential, per rotor swept area, for each resource area in 2001. The annual CF is compared for all regions (Figure 5.12). Overall, wind generation output was reduced in 2001. The 10-20% variations in annual productions are not unusual and are typically due wind variations per year. However, other issues may have been operating during the third quarter of 2001 in Solano, resulting in the nearly 50% reduction in production.



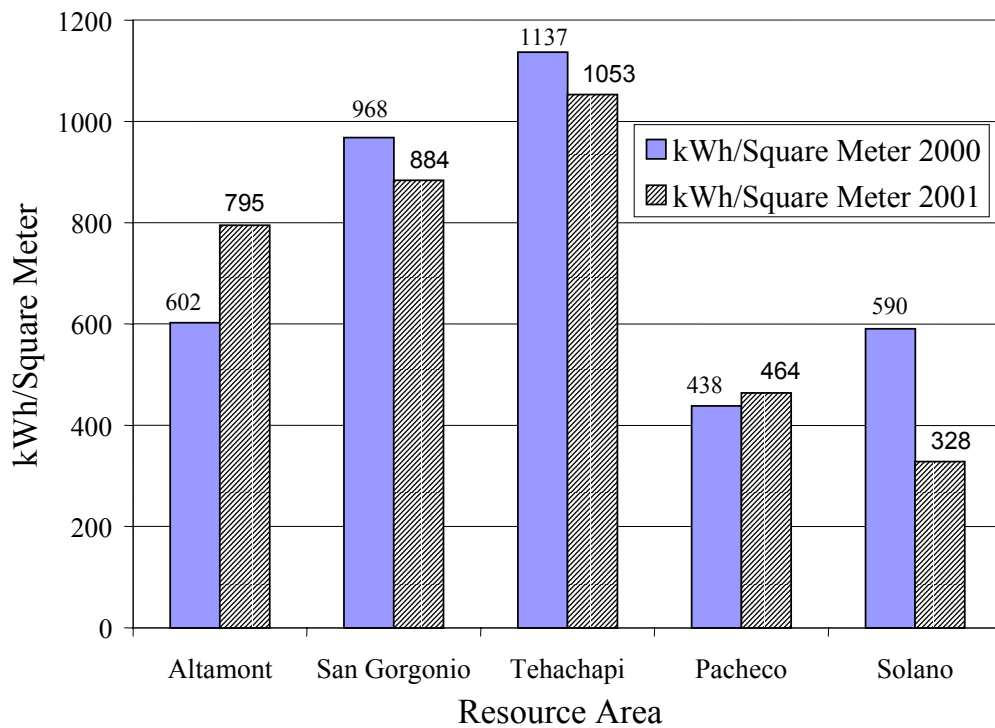
**Figure 5.9. Number of turbines and the change by resource area for 2001**



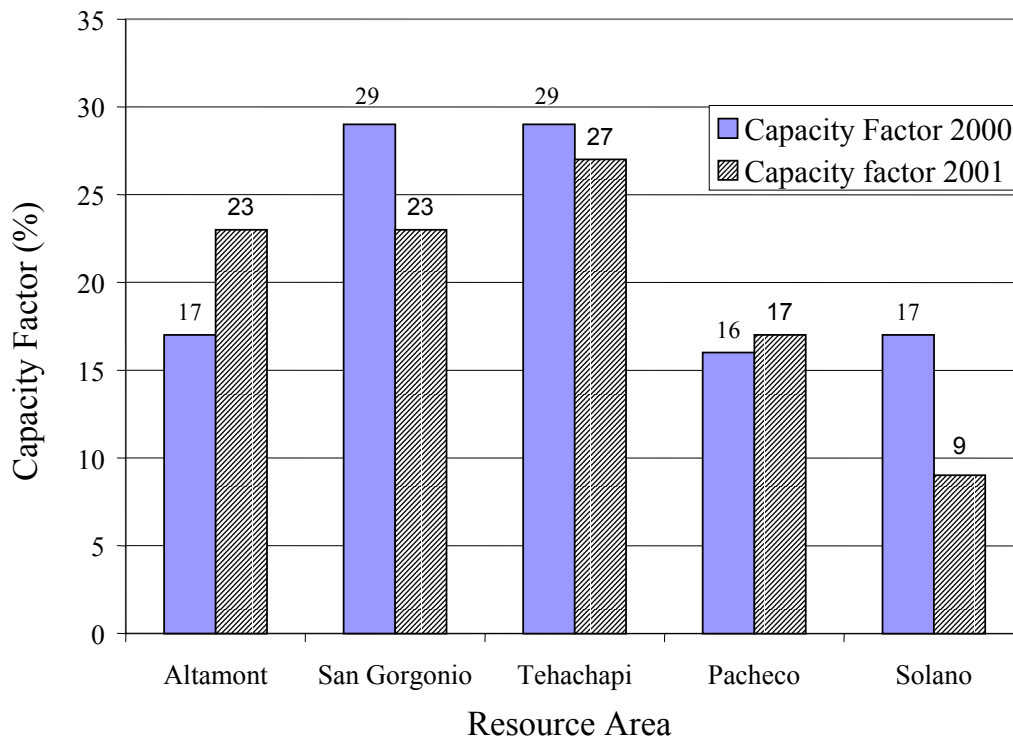
**Figure 5.10. a) Statewide capacity and change by resource area from 2000-2001**



**Figure 5.10. b) Electricity production by resource areas for 2000-2001**



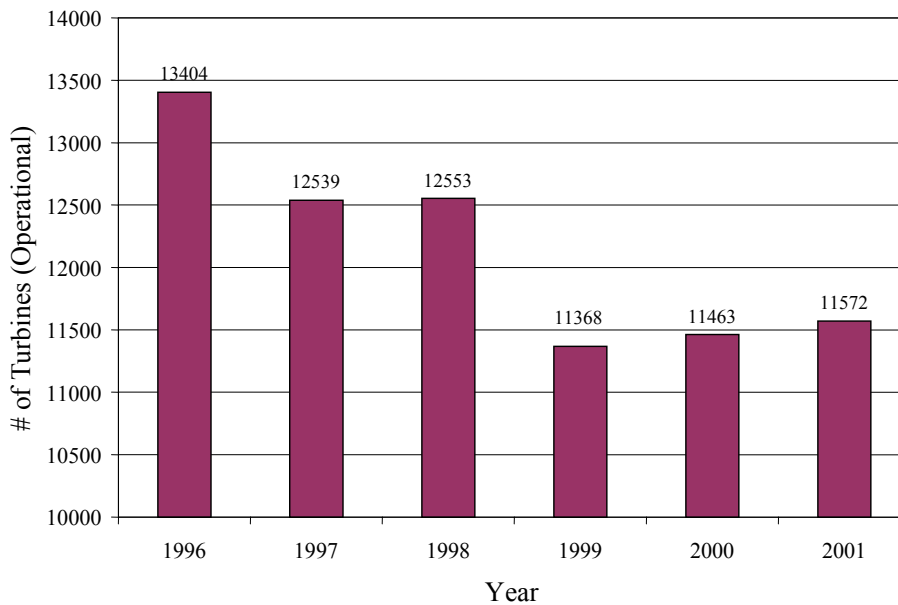
**Figure 5.11. Changes in wind energy density by resource area for 2000-2001**



**Figure 5.12. Capacity factor by resource areas from 2000-2001**

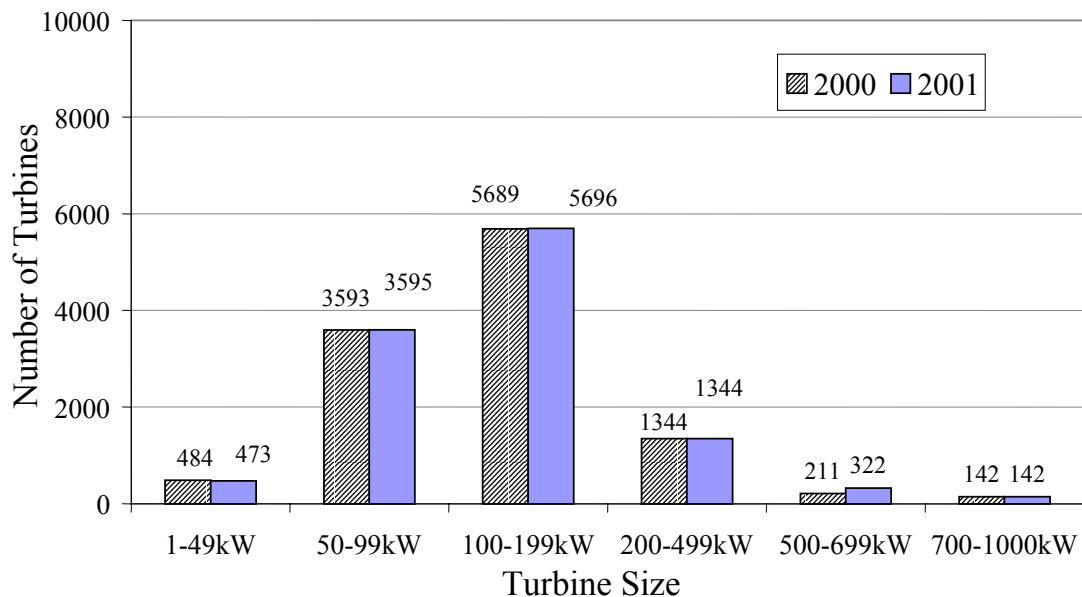
### **Turbine Size and Type**

In the past, the WPRS performance results were tracked horizontal and vertical axis, utility-scale turbines. By 1999 and on, vertical axis machines were not reported in the operating inventory although some still remain intact in the Altamont region. Nearly 100% of new and re-powered capacity comes from three bladed, upwind, horizontal axis turbines, which are manufactured outside of the U.S. With consolidations and restructuring of the California wind industry throughout the 1990s, operators have steadily cannibalized older turbines for parts and re-powered with new turbines whenever possible, resulting in a general decline in the total number of turbines. In 1996, 13,404 turbines were reported in operation, and at the end of 2001, approximately 11,572 turbines were operating (Figure 5.13). The good news is that this reduction in the number of turbines does not indicate a souring market. In fact, replacing older turbines with newer and fewer turbines is helping to revitalize California's aging turbine fleet. CF is on the rise, and generation numbers are remaining steady.



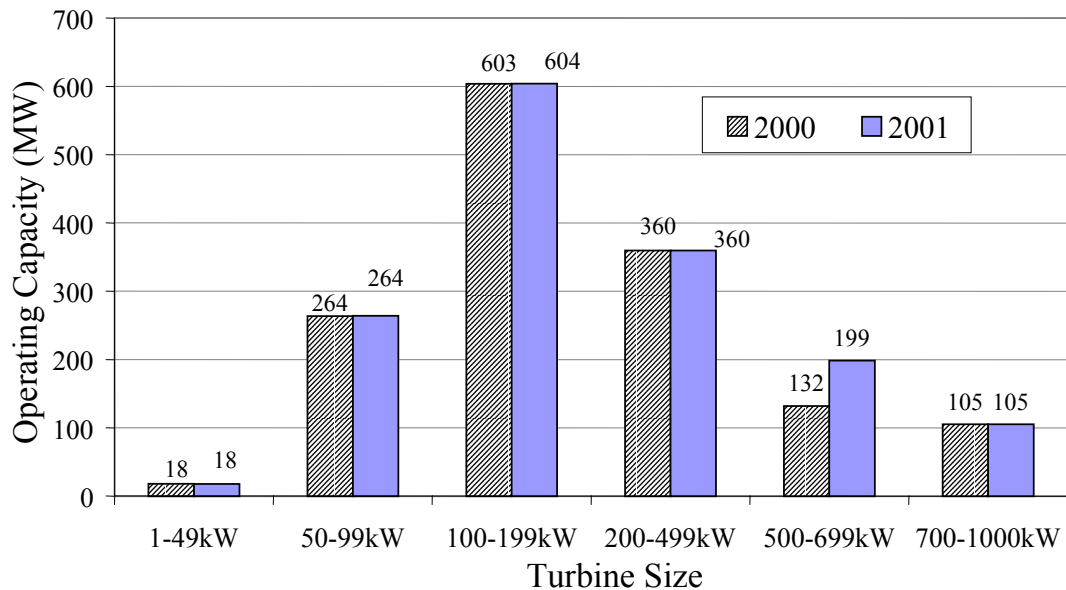
**Figure 5.13. Total number of turbines in operation in 1996 to 2001**

As shown in Figure 5.12, the numbers of turbines have increased 2% from 1999 to 2001. Figure 5.13 summarizes the various turbine numbers found in California from 2000 to 2001. Smaller turbines, such as the Kenetech 100 kW, still dominate the California wind park landscape. In 2001, nearly 84% of the total number of turbines are under 200 kW. Larger, more advance turbines, however, are slowly replacing these smaller machines, as evident in the 2001 figures. Turbines less than 100kW have been declining, and turbines greater than 500kW gained by 50% over 2000 numbers.

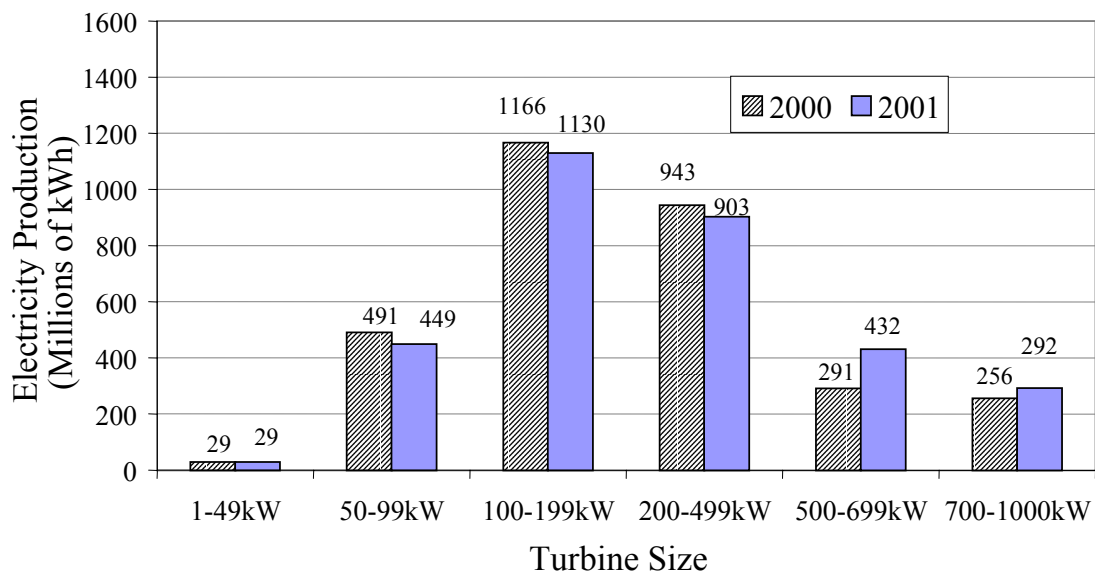


**Figure 5.14. Number of turbines by size from 2000 to 2001**

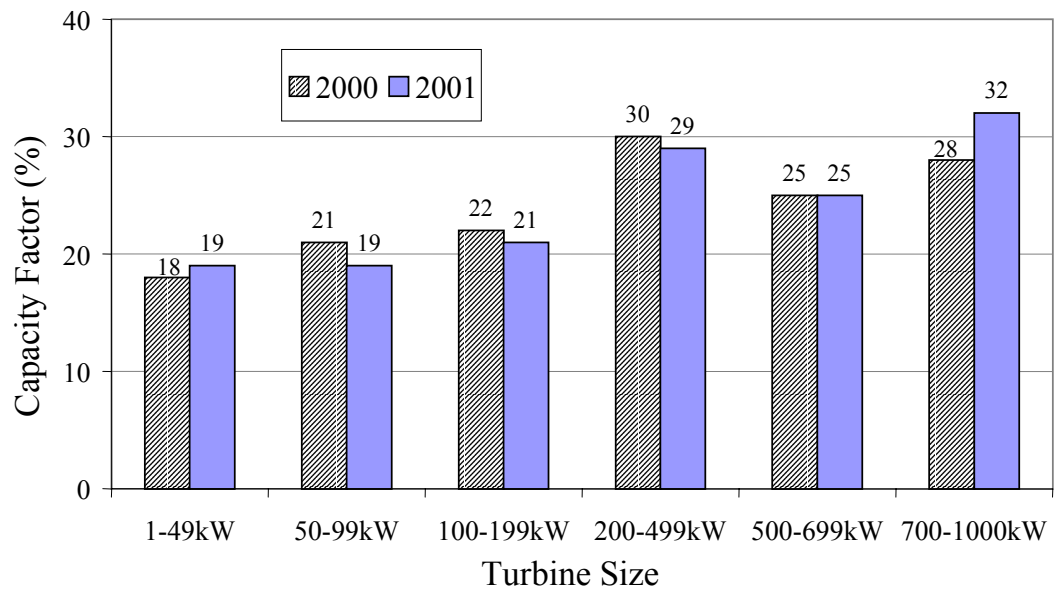
Again, the decline in number of turbines fortunately does not translate to a decline in wind electricity production or efficiency. From Figure 5.15 and Figure 5.16, the 50% gain in the number of turbines larger than 500kW translates to increased operating capacity from 132 MW to 199 MW and nearly 50% increase in production for turbines over 500kW in 2001. Figure 5.17 summarizes the capacity factors by turbine size for 2000 and 2001. Merely counting turbines does not give a good indicator of wind performance trends. In fact, the decline in the total number of turbines is expected to continue as newer, more efficient, and larger capacity turbines replace older, smaller capacity, and less efficient turbines. The result would be a steady increase in annual energy output at an increased but steady CF.



**Figure 5.15. Turbine capacity by turbine size from 2000 to 2001**



**Figure 5.16. Electricity production by turbine size from 2000 to 2001**



**Figure 5.17. Capacity factor by turbine size from 2000 to 2001**

## LARGE WIND TURBINES

### Range 1-49kW Turbine Sizes

Turbine Model:	Carter
Turbine Size:	25kW
Rotor m <sup>2</sup> :	75
Number of Blades:	3
Tower Height:	50 m (164 ft)



### Range 1-49kW Turbine Sizes

Turbine Model:	Enertech (ETK)
Turbine Size:	40kW
Rotor m <sup>2</sup> :	140
Number of Blades:	3
Tower Height:	26 m (84 ft)



### Range 50-99kW Turbine Sizes

Turbine Model:	Windmatic
Turbine Size:	65kW
Rotor m <sup>2</sup> :	154
Number of Blades:	3
Tower Height:	26 m (84 ft)



### Range 50-99kW Turbine Sizes

Turbine Model:	Windmatic
Turbine Size:	95kW
Rotor m <sup>2</sup> :	227
Number of Blades:	3
Tower Height:	28 m (92 ft)



### Range 100-199kW Turbine Sizes

Turbine Model:	Kenetech KCS-56
Turbine Size:	100kW
Rotor m <sup>2</sup> :	247
Number of Blades:	3
Tower Height:	24m, 36m (80ft, 120ft)



### Range 100-199kW Turbine Sizes

Turbine Model:	Nordtank
Turbine Size:	150kW
Rotor m <sup>2</sup> :	330
Number of Blades:	3
Tower Height:	26 m (85 ft)



#### Range 200-499kW Turbine Sizes

Turbine Model:	Vestas V27
Turbine Size:	225kW
Rotor m <sup>2</sup> :	573
Number of Blades:	3
Tower Height:	38 m (124 ft)



#### Range 500-699kW Turbine Sizes

Turbine Model:	Mitsubishi (600)
Turbine Size:	600kW
Rotor m <sup>2</sup> :	1590
Number of Blades:	3
Tower Height:	45 m (148 ft)



#### Range 500-699kW Turbine Sizes

Turbine Model:	Vestas V47
Turbine Size:	660kW
Rotor m <sup>2</sup> :	1195
Number of Blades:	3
Tower Height:	40m - 55m (130ft-180ft)



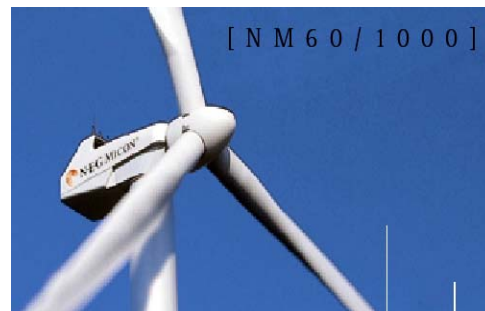
### Range 700-750kW Turbine Sizes

Turbine Model:	EW-750
Turbine Size:	750kW
Rotor m <sup>2</sup> :	2304
Number of Blades:	3
Tower Height:	55m – 65m (180ft-213ft)



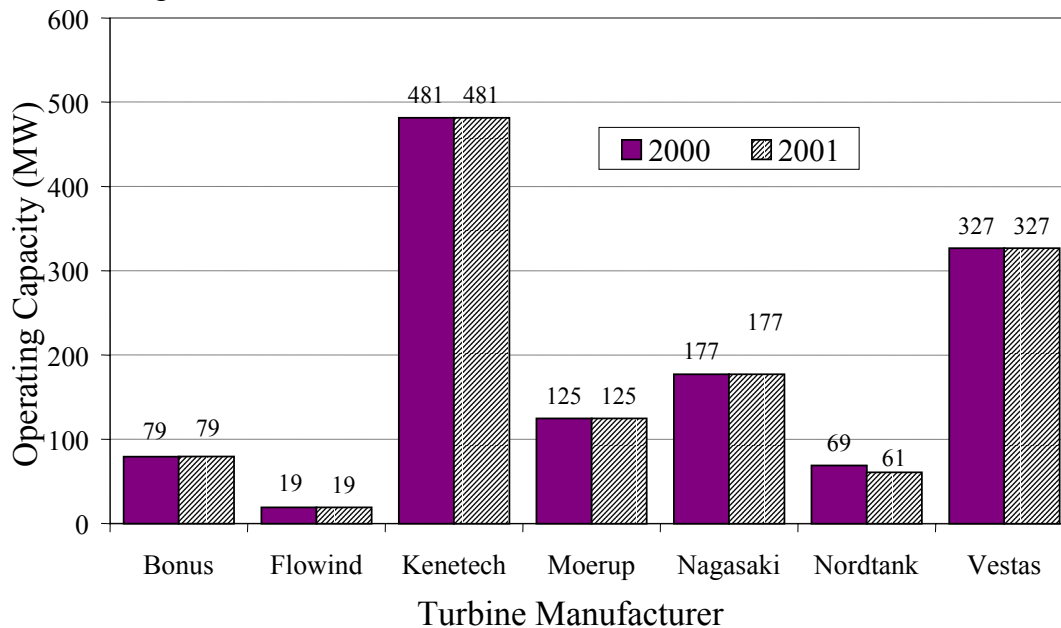
### Range 1000+ kW Turbine Sizes

Turbine Model:	NEG-MICON
Turbine Size:	1000kW
Rotor m <sup>2</sup> :	756
Number of Blades:	3
Tower Height:	70m-79m (230ft-260ft)

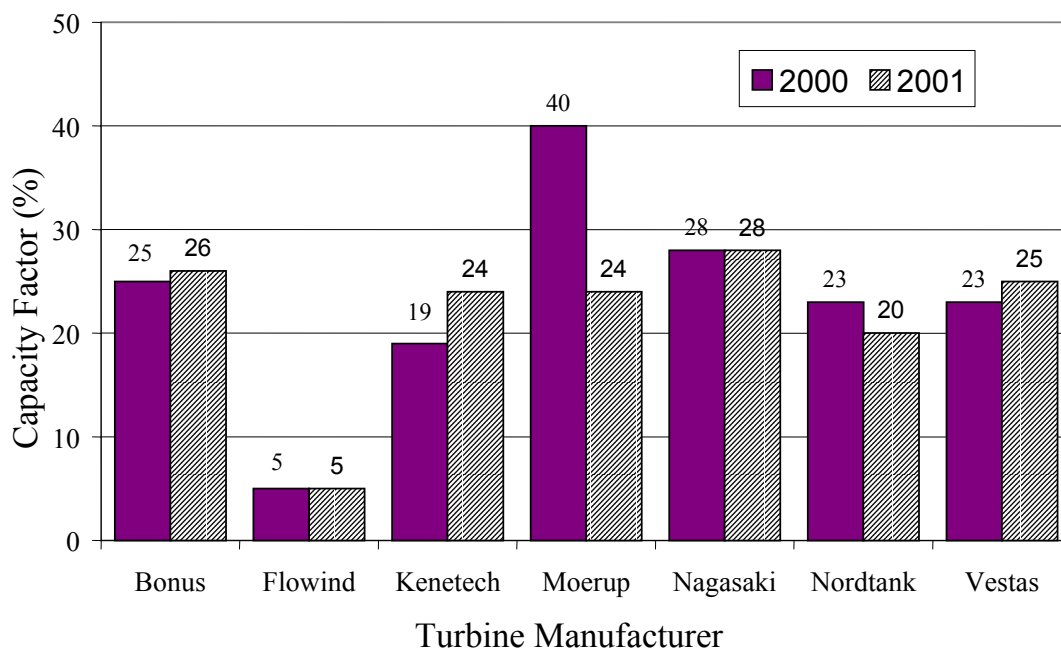


## Turbine Manufacturers

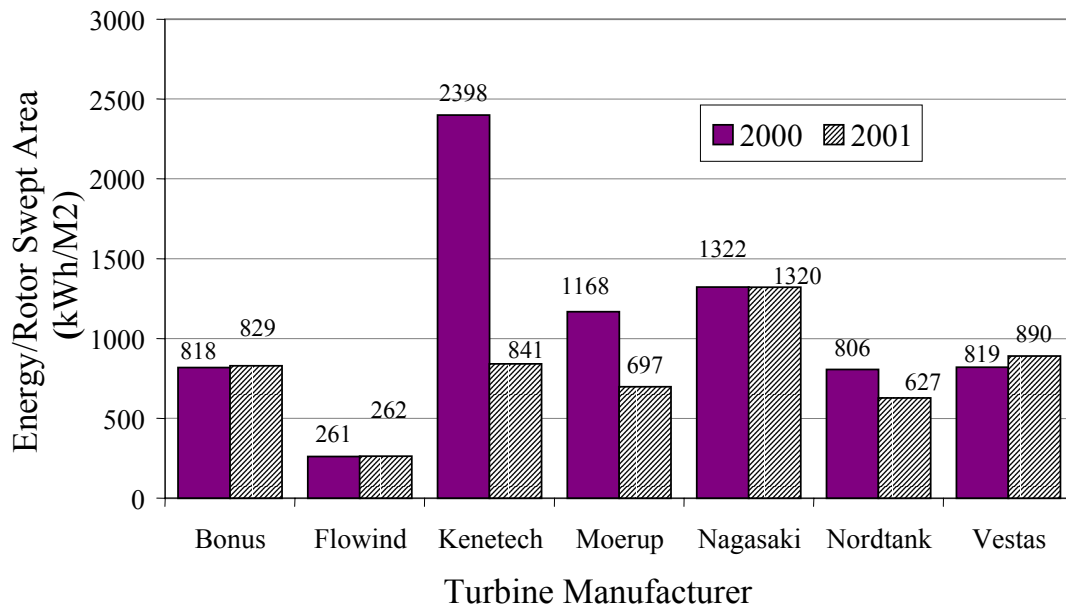
The seven largest wind turbine manufacturers are shown in Figure 5.18. They account for over 82% of wind generation capacity in California in 2001. Their generating CF is shown in Figure 5.19, and performance by energy per rotor swept area (kWh/M<sup>2</sup>) is shown in Figure 5.20.



**Figure 5.18. Operating capacity for 7 major turbine manufacturers**



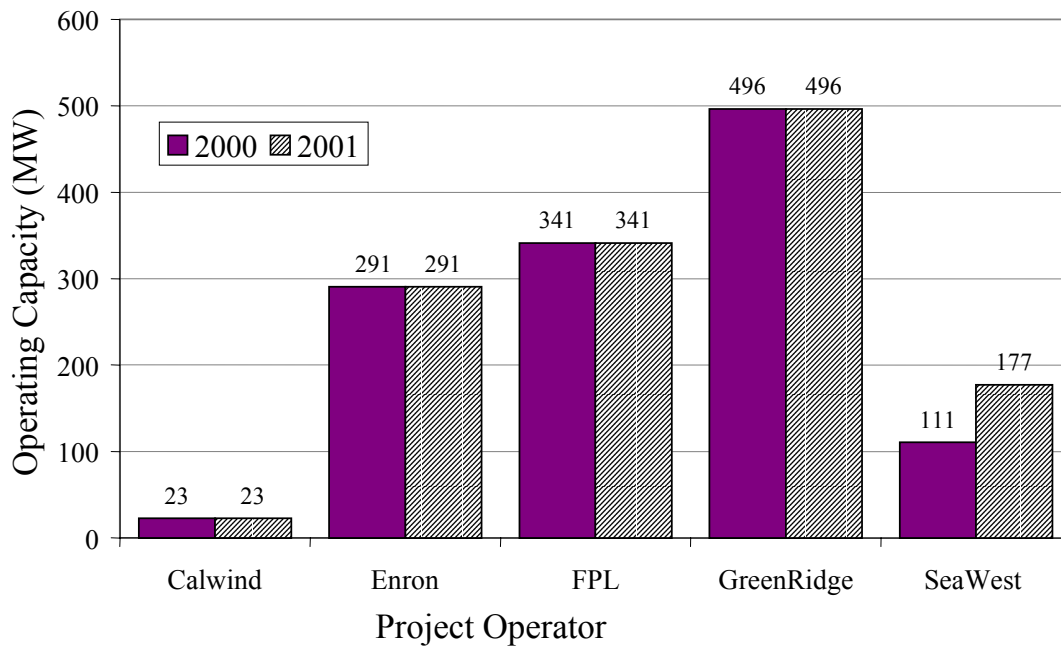
**Figure 5.19. Capacity factor (%) for 7 major turbine manufacturers**



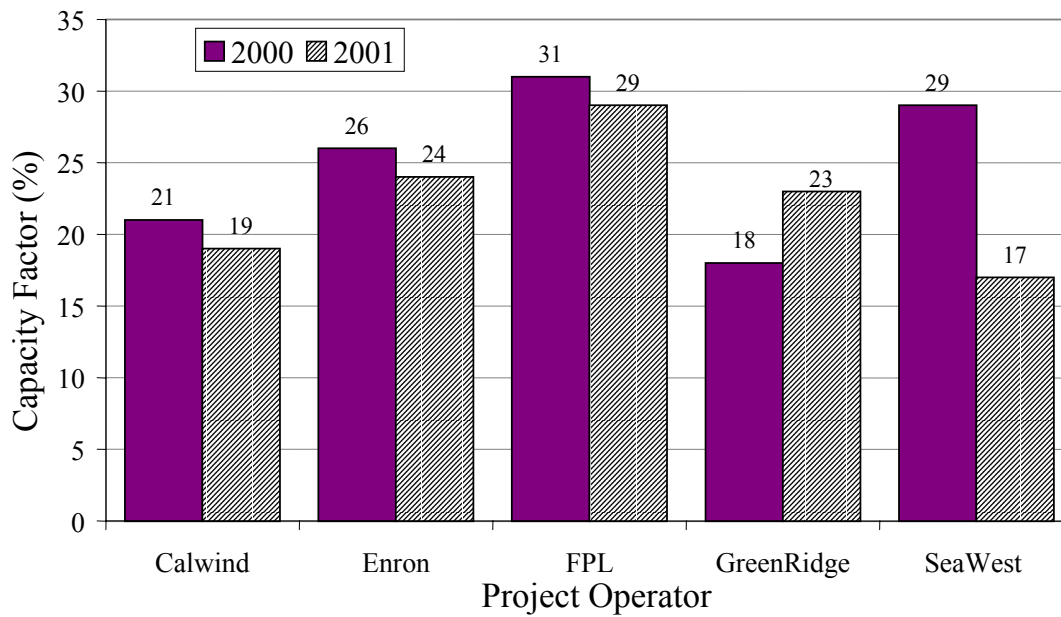
**Figure 5.20. Energy/rotor swept area for 7 major turbine manufacturers**

#### **Wind Project Operators**

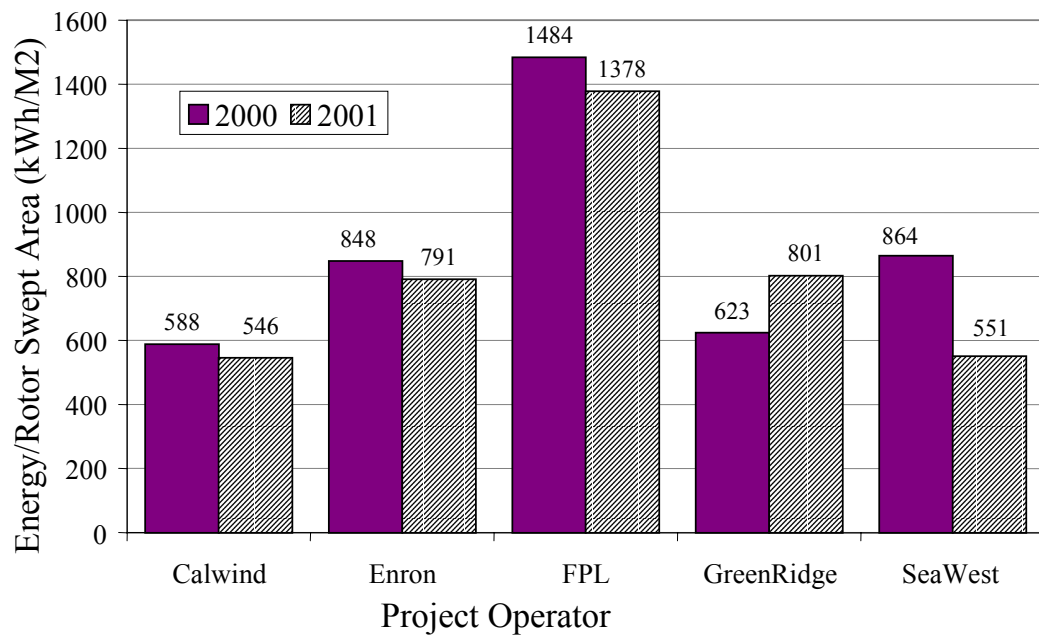
The results for five of the larger wind project operators are presented in the following figures: Figure 5.20 to 5.25. The major operators included SeaWest, Enron, GreenRidge, Florida Power & Light Inc., and Calwind, which is very different from those that existed in the early 1990s. By 1998, Zond was purchased by Enron Corporation, and Green Ridge took over operations at the Kenetech and Flowind facilities in Altamont, and FPL Energy took over Cannon and Cameron Ridge operations. Figure 5.21 shows the operating capacity by operator. Although the Green Ridge facilities have the highest operating capacity, they comprised older and less efficient turbines. From Figure 5.22, CF for Green Ridge facilities are on average 5-6% lower than the newer facilities. Figure 5.22 summarizes the CF for these operators from 2000 and 2001. The CF is comparable and remained steady in the mid- to high 20%. The performance, in terms of rotor swept area, is presented in Figure 5.23, with FPL energy facilities showing the largest potential.



**Figure 5.21. Operating capacity (MW) for top 5 wind facility operators**



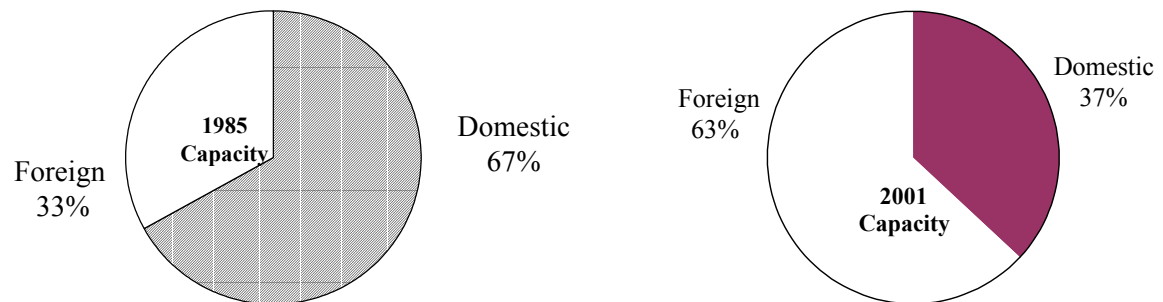
**Figure 5.22. Capacity factors for top 5 wind facility operators**



**Figure 5.23. Energy/rotor swept area (KWh/M<sup>2</sup>) for top five wind facility operators**

## Foreign and Domestic

Figure 5.24 compare domestic and foreign turbine market in 1985 and in 2001. Domestic turbines accounted for 67% of the total installed capacity in 1985 as compared to only 37% in 2001 (Table #2). With nearly all U.S. wind turbine manufacturers out of business by the early 1990s, approximately 35 percent of turbines produced in the US during the 1980s to 1990s remain in operation. Table #2 summarizes the results from 1985-2001, based on percentage of total capacity and percentage capacity change based on added capacity.



**Figure 5.24. Comparison of capacity by turbine origin between 1985 and 2001**

**Table #2 Comparison of domestic and foreign capacity and % change from 1985 to 2001**

Year	Domestic Capacity (%)	Foreign Capacity (%)
1985	67	33
1986	55	45
1987	56	44
1988	58	42
1989	52	48
1990	53	47
1991	46	54
1992	47	53
1993	45	55
1994	46	54
1995	43	57
1996	45	55
1997	47	57
1998	38	62
1999	35	65
2000	40	60
2001	37	63

## **CHAPTER 6      SUMMARY TABLES**

On the following pages, summary tables include data for all wind projects submitting 2001 quarterly reports to the Commission as part of the WPRS program. Summary tables are extracted from project operator quarterly reports compiled in Chapter 7 for 2001. Projects which “failed to file” for this period are also summarized. The data include information about specific resource areas, turbine sizes, turbine types, turbine manufacturers, turbine operators, and turbine origins. The tables are listed in the following order from 2001 to 2000.

- Statewide and Resource Area Summary
- Turbine Size Summary
- Turbine Manufacturer Summary
- Wind Operator Summary

Although the staff has been continuously working with facilities to standardize reporting formats, some operators still have not complied with the new standard formats. Reports are still filed with combined totals for multiple wind facilities, making it difficult to track individual facilities. In addition, some operators have failed to file reports, resulting in missing data. These result in discrepancies with utility reported totals.

Note that the cumulative turbine capacity reported includes new and re-powered turbines beginning the quarter that they came on line. Because new turbine capacity did not represent a significant percentage of cumulative capacities, the impact on annualized totals was considered minimal.

**FACILITIES THAT FAIL TO FILE**  
**(Data listed are from utility summary reports)**  
**Table #3**

**Year: 2001**

<i>QFID</i>	<i>Project Name</i>	<i>Cummulative Capacity (MW)</i>	<i>Total Output (kWh)</i>	<i>Location</i>	<i>Source Utility</i>
6090	Alta Mesa Pwr. Purch. Contract Trust	28.17	111,212,802.00	San Geronio	SCE
6011	Windland, Inc. Boxcar I Purchase Contract Trust	5.22	19,548,106.00	Tehachapi	SCE
6097	Windland, Inc. Boxcar II Purchase Contract Trst	7.74	25,512,586.00	Tehachapi	SCE
6234	Oak Creek Energy Systems Inc.	27.47	38,116,704.00	Tehachapi	SCE
16W009	Altamont-Midway, Ltd.	12.5	17,637,779.49	Altamont Pass	PG&E
01W001	Buena Vista Energy, LLC	37.55	19,430,460.53	Altamont Pass	PG&E
16W028	Patterson Pass Wind Farm LLC	22	41,090,798.22	Altamont Pass	PG&E
01W094	Tres Vaqueros Wind Farms, LLC	28	36,172,566.74	Altamont Pass	PG&E
<b>Total:</b>		168.65	308,721,802.98		

**Year: 2000**

**Table #4**

<i>QFID</i>	<i>Project Name</i>	<i>Cummulative Capacity (MW)</i>	<i>Total Output (kWh)</i>	<i>Location</i>	<i>Source Utility</i>
6090	Alta Mesa Pwr. Purch. Contract Trust	28.17	73,355,338.00	San Geronio	SCE
6011	Windland, Inc. Boxcar I Purchase Contract Trust	6.55	11,456,050.00	Tehachapi	SCE
6097	Windland, Inc. Boxcar II Purchase Contract Trst	7.74	17,123,898.00	Tehachapi	SCE
6234	Oak Creek Energy Systems Inc.	27.47	77,532,602.00	Tehachapi	SCE
16W009	Altamont-Midway, Ltd.	12.5	15,794,964.00	Altamont Pass	PG&E
01W001	Buena Vista Energy, LLC	37.55	15,718,679.60	Altamont Pass	PG&E
16W028	Patterson Pass Wind Farm LLC	22	40,893,871.00	Altamont Pass	PG&E
01W094	Tres Vaqueros Wind Farms, LLC	28	32,975,550.10	Altamont Pass	PG&E
<b>Total:</b>		169.98	284,850,952.70		

**Note:** Capacity and production numbers for facilities that failed to file in the reporting timeframe are given above. The data are obtained from utility reports and are not included in WPRS summary data tables in the sections following. To estimate statewide capacity and production numbers, the facility operators who failed to report their numbers (capacity or production) will need to be added to the summary data.

**TABLE #5**  
**2001 STATEWIDE DATA SUMMARY TABLE**

<b>Data Category</b>	<b>Net Capacity (MW)</b>	<b>New Capacity (MW)</b>	<b>Output (kWh)</b>	<b>Actual Capacity Factor (%)</b>	<b>kWh/Square Meter</b>	<b>Number of Turbines</b>	<b>Change in Turbines</b>
<b>STATEWIDE</b>							
1st Quarter	1,481	0	518,549,369.50	16%	144.39	11446	-2
2nd Quarter	1,482	1	1,132,881,649.88	35%	315.13	11461	15
3th Quarter	1,527	45	1,090,708,034.10	33%	294.20	11535	74
4th Quarter	1,549	22	492,951,014.20	15%	130.98	11572	37
<b>2001 Totals</b>	<b>1,549</b>	<b>68</b>	<b>3,235,090,067.68</b>	<b>24%</b>	<b>884.70</b>	<b>11572</b>	<b>124</b>
<b>RESOURCE AREA</b>							
<b>Altamont</b>							
1st Quarter	476.02	0	93,387,896.40	9%	77.78	4773	0
2nd Quarter	476.92	0.9	288,445,145.20	28%	239.62	4788	15
3th Quarter	476.92	0	484,626,508.30	46%	402.6	4788	0
4th Quarter	476.92	0	90,210,683.40	9%	74.94	4788	0
<b>2001 Totals</b>	<b>476.92</b>	<b>0.9</b>	<b>956,670,233.30</b>	<b>23%</b>	<b>794.94</b>	<b>4788</b>	<b>15</b>
<b>San Geronio</b>							
1st Quarter	317.77	0	133,468,713.50	19%	161.2	2445	0
2nd Quarter	318.03	0.26	286,240,548.70	41%	345.47	2445	0
3th Quarter	362.43	44.4	229,571,629.50	29%	243.96	2519	74
4th Quarter	384.63	22.2	132,552,379.30	16%	132.91	2556	37
<b>2001 Totals</b>	<b>384.63</b>	<b>66.86</b>	<b>781,833,271.00</b>	<b>23%</b>	<b>883.6</b>	<b>2556</b>	<b>111</b>
<b>Tehachapi</b>							
1st Quarter	605.83	0	278,353,985.90	21%	206.68	3444	-2
2nd Quarter	605.83	0	522,665,552.08	39%	388.09	3444	0
3th Quarter	605.83	0	361,273,043.50	27%	268.25	3444	0
4th Quarter	605.83	0	256,313,430.50	19%	190.32	3444	0
<b>2001 Totals</b>	<b>605.83</b>	<b>0</b>	<b>1,418,606,011.98</b>	<b>27%</b>	<b>1053.34</b>	<b>3444</b>	<b>-2</b>
<b>Pachecho</b>							
1st Quarter	16.4	0	2,963,613.00	8%	55.76	167	0
2nd Quarter	16.4	0	8,500,640.00	24%	159.93	167	0
3th Quarter	16.4	0	10,472,662.00	29%	197.03	167	0
4th Quarter	16.4	0	2,714,251.00	8%	51.07	167	0
<b>2001 Totals</b>	<b>16.4</b>	<b>0</b>	<b>24,651,166.00</b>	<b>17%</b>	<b>463.79</b>	<b>167</b>	<b>0</b>
<b>Solano</b>							
1st Quarter	65.1	0	10,375,160.70	7%	63.75	617	0
2nd Quarter	65.1	0	27,029,763.90	19%	166.1	617	0
3th Quarter	65.1	0	4,764,190.80	3%	29.28	617	0
4th Quarter	65.1	0	11,160,270.00	8%	68.58	617	0
<b>2001 Totals</b>	<b>65.1</b>	<b>0</b>	<b>53,329,385.40</b>	<b>9%</b>	<b>327.71</b>	<b>617</b>	<b>0</b>

**TABLE #6**  
**2000 STATEWIDE DATA SUMMARY TABLE**

<b>Data Category</b>	<b>Net Capacity (MW)</b>	<b>New Capacity (MW)</b>	<b>Output (kWh)</b>	<b>Actual Capacity Factor (%)</b>	<b>kWh/Square Meter</b>	<b>Number of Turbines</b>	<b>Change in Turbines</b>
<b>STATEWIDE</b>							
1st Quarter	1,481	0	575,865,154.50	18%	160.53	11448	0
2nd Quarter	1,482	1	1,156,489,250.00	36%	321.88	11463	15
3th Quarter	1,482	0	962,846,948.00	30%	268.39	11463	0
4th Quarter	1,482	0	480,484,333.00	15%	134.21	11463	0
<b>2000 Totals</b>	<b>1,482</b>	<b>1</b>	<b>3,175,685,685.50</b>	<b>24%</b>	<b>885.01</b>	<b>11463</b>	<b>15</b>
<b>RESOURCE AREA</b>							
<b>Altamont</b>							
1st Quarter	476.02	0	76,768,207.00	7%	63.93	4773	-9
2nd Quarter	476.92	0.9	278,098,089.00	27%	231.03	4788	15
3th Quarter	476.92	0	290,688,478.00	28%	241.49	4788	0
4th Quarter	476.92	0	78,487,263.00	8%	65.2	4788	0
<b>2000 Totals</b>	<b>476.92</b>	<b>0.9</b>	<b>724,042,037.00</b>	<b>17%</b>	<b>601.65</b>	<b>4788</b>	<b>6</b>
<b>San Geronio</b>							
1st Quarter	317.42	0	164,349,167.50	24%	198.7	2445	208
2nd Quarter	317.42	0	287,786,663.00	41%	347.91	2445	0
3th Quarter	317.42	0	233,506,054.00	34%	282.29	2445	0
4th Quarter	317.42	0	114,961,652.00	17%	138.98	2445	0
<b>2000 Totals</b>	<b>317.42</b>	<b>0</b>	<b>800,603,536.50</b>	<b>29%</b>	<b>967.9</b>	<b>2445</b>	<b>208</b>
<b>Tehachapi</b>							
1st Quarter	605.91	0	323,983,338.00	24%	240.52	3446	-119
2nd Quarter	605.91	0	541,914,153.00	41%	402.31	3446	0
3th Quarter	605.91	0	389,470,853.00	29%	289.14	3446	0
4th Quarter	605.91	0	276,340,531.00	21%	205.15	3446	0
<b>2000 Totals</b>	<b>605.91</b>	<b>0</b>	<b>1,531,708,875.00</b>	<b>29%</b>	<b>1137.12</b>	<b>3446</b>	<b>-119</b>
<b>Pachecho</b>							
1st Quarter	16.4	0	2,696,348.00	8%	50.73	167	0
2nd Quarter	16.4	0	9,043,399.00	25%	170.14	167	0
3th Quarter	16.4	0	9,166,679.00	26%	172.46	167	0
4th Quarter	16.4	0	2,359,361.00	7%	44.39	167	0
<b>2000 Totals</b>	<b>16.4</b>	<b>0</b>	<b>23,265,787.00</b>	<b>16%</b>	<b>437.72</b>	<b>167</b>	<b>0</b>
<b>Solano</b>							
1st Quarter	65.1	0	8,068,094.00	6%	49.58	617	0
2nd Quarter	65.1	0	39,646,946.00	28%	243.63	617	0
3th Quarter	65.1	0	40,014,884.00	28%	245.89	617	0
4th Quarter	65.1	0	8,335,526.00	6%	51.22	617	0
<b>2000 Totals</b>	<b>65.1</b>	<b>0</b>	<b>96,065,450.00</b>	<b>17%</b>	<b>590.32</b>	<b>617</b>	<b>0</b>

**TABLE #7**  
**2001 TURBINE DATA SUMMARY TABLE**

<b>Data Category</b>	<b>Net Capacity (MW)</b>	<b>New Capacity (MW)</b>	<b>Output (kWh)</b>	<b>Actual Capacity Factor (%)</b>	<b>kWh/Square Meter</b>	<b>Number of Turbines</b>	<b>Change in Turbines</b>
<b>TURBINE SIZE</b>							
<b>1-49 kW</b>							
1st Quarter	17.83	0	3,931,087.90	10%	64.10	473	0
2nd Quarter	17.83	0	10,431,584.80	27%	170.1	473	0
3th Quarter	17.83	0	11,107,542.80	28%	181.1	473	0
4th Quarter	17.83	0	3,865,404.50	10%	63.0	473	0
<b>2001 Totals</b>	<b>17.83</b>	<b>0</b>	<b>29,335,620.00</b>	<b>19%</b>	<b>478.4</b>	<b>473</b>	<b>0</b>
<b>50-99 kW</b>							
1st Quarter	262.49	0	81,423,139.60	14%	110.96	3576	0
2nd Quarter	263.65	1.16	172,127,228.70	30%	233.39	3595	19
3th Quarter	263.65	0	126,202,818.40	22%	171.12	3595	0
4th Quarter	263.65	0	69,581,994.20	12%	94.35	3595	0
<b>2001 Totals</b>	<b>263.65</b>	<b>1.16</b>	<b>449,335,180.90</b>	<b>19%</b>	<b>609.82</b>	<b>3595</b>	<b>19</b>
<b>100-199 kW</b>							
1st Quarter	604.11	0	134,258,211.60	10%	90.17	5696	0
2nd Quarter	604.11	0	370,844,162.80	28%	249.08	5696	0
3th Quarter	604.11	0	509,055,317.80	38%	341.9	5696	0
4th Quarter	604.11	0	115,931,961.70	9%	77.86	5696	0
<b>2001 Totals</b>	<b>604.11</b>	<b>0</b>	<b>1,130,089,653.90</b>	<b>21%</b>	<b>759.01</b>	<b>5696</b>	<b>0</b>
<b>200-499 kW</b>							
1st Quarter	359.69	0	163,946,291.40	21%	196.99	1344	0
2nd Quarter	359.69	0	327,386,477.10	42%	393.37	1344	0
3th Quarter	359.69	0	255,546,217.30	32%	307.05	1344	0
4th Quarter	359.69	0	155,801,289.90	20%	187.2	1344	0
<b>2001 Totals</b>	<b>359.69</b>	<b>0</b>	<b>902,680,275.70</b>	<b>29%</b>	<b>1084.61</b>	<b>1344</b>	<b>0</b>
<b>500-699 kW</b>							
1st Quarter	131.97	0	76,165,687.00	26%	281.85	211	0
2nd Quarter	131.97	0	147,081,578.00	51%	544.27	211	0
3th Quarter	176.37	44.4	109,286,321.00	28%	285.55	285	74
4th Quarter	198.57	22.2	98,912,711.00	23%	225.34	322	37
<b>2001 Totals</b>	<b>198.57</b>	<b>66.6</b>	<b>431,446,297.00</b>	<b>25%</b>	<b>1,337.01</b>	<b>322</b>	<b>111</b>
<b>700-1000 kW</b>							
1st Quarter	105.10	0	58,824,952.00	26%	287.32	142	0
2nd Quarter	105.10	0	105,010,618.48	46%	512.91	142	0
3th Quarter	105.10	0	79,509,816.80	35%	388.35	142	0
4th Quarter	105.10	0	48,857,652.90	21%	238.64	142	0
<b>2001 Totals</b>	<b>105.10</b>	<b>0</b>	<b>292,203,040.18</b>	<b>32%</b>	<b>1,427.22</b>	<b>142</b>	<b>0</b>

**TABLE #8**  
**2000 TURBINE DATA SUMMARY TABLE**

Data Category	Net Capacity (MW)	New Capacity (MW)	Output (kWh)	Actual Capacity Factor (%)	kWh/Square Meter	Number of Turbines	Change in Turbines
<b>TURBINE SIZE</b>							
<b>1-49 kW</b>							
1st Quarter	18.18	0	4,532,783.00	11%	72.39	484	0
2nd Quarter	18.18	0	11,544,934.00	29%	184.4	484	0
3th Quarter	18.18	0	9,307,434.00	23%	148.6	484	0
4th Quarter	18.18	0	3,506,236.00	9%	56.0	484	0
<b>2000 Totals</b>	18.18	0	28,891,387.00	18%	461.4	484	0
<b>50-99 kW</b>							
1st Quarter	262.62	0	105,053,786.00	18%	143.1	3578	0
2nd Quarter	263.52	0.9	183,397,063.00	32%	248.79	3593	15
3th Quarter	263.52	0	131,551,896.00	23%	178.46	3593	0
4th Quarter	263.52	0	70,478,876.00	12%	95.61	3593	0
<b>2000 Totals</b>	263.52	0.9	490,481,621.00	21%	665.96	3593	15
<b>100-199 kW</b>							
1st Quarter	603.36	0	155,412,625.30	12%	104.53	5689	0
2nd Quarter	603.36	0	440,836,479.00	33%	296.49	5689	0
3th Quarter	603.36	0	420,925,267.80	32%	283.1	5689	0
4th Quarter	603.36	0	149,163,486.90	11%	100.32	5689	0
<b>2000 Totals</b>	603.36	0	1,166,337,859.00	22%	784.44	5689	0
<b>200-499 kW</b>							
1st Quarter	359.69	0	200,729,245.20	25%	241.19	1344	0
2nd Quarter	359.69	0	325,300,822.50	41%	390.87	1344	0
3th Quarter	359.69	0	247,771,760.10	31%	297.71	1344	0
4th Quarter	359.69	0	169,622,205.80	22%	203.81	1344	0
<b>2000 Totals</b>	359.69	0	943,424,033.60	30%	1133.58	1344	0
<b>500-699 kW</b>							
1st Quarter	131.97	0	51,527,339.00	18%	190.67	211	0
2nd Quarter	131.97	0	106,905,498.50	37%	395.60	211	0
3th Quarter	131.97	0	85,150,004.10	29%	315.09	211	0
4th Quarter	131.97	0	47,176,619.80	16%	174.57	211	0
<b>2000 Totals</b>	131.97	0	290,759,461.40	25%	1,075.93	211	0
<b>700-1000 kW</b>							
1st Quarter	105.10	0	58,609,376.00	25%	286.27	142	0
2nd Quarter	105.10	0	88,504,453.00	38%	432.29	142	0
3th Quarter	105.10	0	68,140,586.00	30%	332.82	142	0
4th Quarter	105.10	0	40,536,908.50	18%	198.00	142	0
<b>2000 Totals</b>	105.10	0	255,791,323.50	28%	1,249.38	142	0

**TABLE #9**  
**2001 TURBINE MANUFACTURER DATA SUMMARY TABLE**

Data Category	Net Capacity (MW)	Change in Capacity (MW)	Output (kWh)	Actual Capacity Factor (%)	kWh/Square Meter	Number of Turbines	Change in # of Turbines
<b>Turbine Manufacturer</b>							
Alaska Applied Sciences (USA)	0.30	0	768,854.60	29%	1,132.33	14	0
American M.A.N. (Germany)	11.24	0	15,878,386.00	16%	459.40	281	0
Bonus Energy A/S (Denmark)	79.40	0.26	179,628,119.70	26%	828.80	810	4
Carter Wind Systems (USA)	0.18	0	368,907.40	23%	702.68	7	0
Danwin A/S (Denmark)	14.11	0	23,043,726.70	19%	811.40	96	0
Delta (Unknown)	0.75	0	385,924.80	6%	255.58	5	0
Energy Sciences, Inc (USA)	1.10	0	1,281,914.00	13%	276.16	22	0
Enertech (USA)	5.76	0	9,169,470.00	18%	454.83	144	0
Enron Wind Corp. (USA)	39.75	0	109,379,492.40	31%	895.73	53	0
FloWind Corp. (USA)	18.91	0	8,446,933.20	5%	262.33	118	0
James Howden and Company (Scotland)	0.99	0	0	0%	-	3	0
Kenetech Windpower Inc (USA)	481.30	0	991,417,504.40	24%	841.07	4352	0
Mitsubishi Power Systems, Inc. (Japan)	66.60	66.6	41,323,909.00	7%	244.93	111	111
Moerup Manufacturing Co. (Denmark)	124.66	0.9	261,129,541.40	24%	696.71	1025	15
Nagasaki Shipyard and Machinery (Japan)	177.15	0	438,761,579.00	28%	1,319.96	626	0
NedWind ab. (Netherlands)	9.42	0	23,068,876.00	28%	887.26	20	0
NEG Micon A/S (Denmark)	55.30	0	161,357,386.18	33%	2,701.72	79	0
Nordex Wind Turbines (Germany)	10.00	0	21,466,161.60	25%	937.39	10	0
Nordtank Energy Group (Denmark)	60.81	0	107,101,399.40	20%	626.51	763	0
Vanguard (USA)	7.80	0	4,330,261.50	6%	479.01	40	0
Vestas Wind Systems A/S (Denmark)	326.68	0	723,383,350.30	25%	889.69	2543	0
Wincon Energy Systems (USA)	22.02	0	33,886,158.30	18%	511.90	206	0
Wind Energy Group (England)	5	0	11033772.9	25%	1,123.60	20	0
Windane (Denmark)	13.6	0	45749240	38%	1481.90	34	0
Windmatic (Denmark)	16.02	0	22729198.9	16%	620.83	190	0

**TABLE #10**  
**2000 TURBINE MANUFACTURER DATA SUMMARY TABLE**

Data Category	Net Capacity (MW)	Change in Capacity (MW)	Output (kWh)	Actual Capacity Factor (%)	kWh/Square Meter	Number of Turbines	Change in # of Turbines
<b>Turbine Manufacturer</b>							
American M.A.N. (Germany)	11.32	0	17,012,956.00	17%	488.75	283	0
Bonus Energy A/S (Denmark)	79.31	0	177,071,343.00	25%	818.37	808	0
Carter Wind Systems (USA)	0.75	0	1,444,124.00	22%	641.83	30	0
Danwin A/S (Denmark)	14.11	0	91,046,034.20	74%	3,205.85	96	0
Delta (Unknown)	0.75	0	763,666.00	12%	505.74	5	0
Energy Sciences, Inc (USA)	1.10	0	1,388,726.00	14%	299.17	22	0
Enertech (USA)	5.76	0	7,572,127.00	15%	375.60	144	0
Enron Wind Corp. (USA)	39.75	0	104,329,005.00	30%	854.37	53	0
FloWind Corp. (USA)	18.91	0	8,408,079.00	5%	261.12	118	0
James Howden and Company (Scotland)	0.99	0	-	0%	-	3	0
Kenetech Windpower Inc (USA)	481.30	0	795,091,597.00	19%	2,398.14	4352	0
Moerup Manufacturing Co. (Denmark)	124.66	0.9	437,656,613.10	40%	1,167.69	1025	15
Nagasaki Shipyard and Machinery (Japan)	177.15	0	439,353,422.00	28%	1,321.74	626	0
NedWind ab. (Netherlands)	9.42	0	22,309,381.00	27%	858.05	20	0
NEG Micon A/S (Denmark)	55.30	0	128,228,297.50	26%	2,147.01	79	0
Nordex Wind Turbines (Germany)	10.00	0	23,234,021.00	27%	1,014.59	10	0
Nordtank Energy Group (Denmark)	68.81	0	137,759,817.40	23%	805.85	763	0
Vanguard (USA)	7.80	0	5,069,649.00	7%	560.80	40	0
Vestas Wind Systems A/S (Denmark)	326.68	0	665,856,735.80	23%	818.94	2543	0
Wincon Energy Systems (USA)	21.27	0	35,396,164.00	19%	551.81	199	0
Wind Energy Group (England)	5.00	0	9,240,623.00	21%	941.00	20	0
Windane (Denmark)	13.60	0	44512160	37%	1,441.83	34	0
Windmatic (Denmark)	16.02	0	22941144.5	16%	626.62	190	0

**TABLE #11**  
**2001 OPERATOR SUMMARY TABLE**

<b>Data Category</b>	<b>Net Capacity (MW)</b>	<b>Change in Capacity (MW)</b>	<b>Output (kWh)</b>	<b>Actual Capacity Factor (%)</b>	<b>kWh/Square Meter</b>	<b>Number of Turbines</b>	<b>Change in # of Turbines</b>
<b>PROJECT OPERATOR</b>							
AB Energy	6.97	0	18,205,258.00	30%	1,024.90	31	0
Calwind Rosources, Inc.	22.82	0	38,494,248.00	19%	545.62	351	0
Coram	11.24	0	15,878,386.00	16%	459.40	281	0
Difwind Farms	24.67	0	39,148,134.00	18%	574.79	244	0
Enron	290.51	0	612,521,561.70	24%	791.12	2413	0
EUI Management	25.71	0.26	47,182,614.60	21%	743.50	171	4
FPL Corp.	341.24	0	866,451,418.58	29%	1,377.74	1256	0
GreenRidge	496.37	0	979,569,055.30	23%	801.44	4651	0
International Turbine Research	16.41	0	24,651,166.00	17%	463.79	167	0
Northwind	13.10	0	19,637,385.00	17%	495.22	189	0
San Gorgonio Farms, Inc.	33.14	0	104,002,949.00	36%	1,235.16	225	0
SeaWest Energy Group	177.17	67.5	270,471,595.00	17%	551.14	947	126
Southern California Sunbelt	11.01	0	15,352,574.40	16%	533.87	139	0
Westwind Association	16.96	0	29,083,368.00	20%	616.94	179	0
WindPower Partners 1993 LP	53.50	0	133,068,305.90	28%	1,152.33	190	0
Wintec	8.08	0	21,372,048.20	30%	865.97	138	0

**TABLE #12**  
**2000 OPERATOR SUMMARY TABLE**

<b>Data Category</b>	<b>Net Capacity (MW)</b>	<b>Change in Capacity (MW)</b>	<b>Output (kWh)</b>	<b>Actual Capacity Factor (%)</b>	<b>kWh/Square Meter</b>	<b>Number of Turbines</b>	<b>Change in # of Turbines</b>
<b>PROJECT OPERATOR</b>							
AB Energy	6.97	0	19,319,651.00	32%	1,087.63	31	0
Calwind Rosources, Inc.	22.82	0	41,471,296.00	21%	587.82	351	0
Coram	11.32	0	17,012,956.00	17%	488.75	283	0
Difwind Farms	24.67	0	55,883,585.00	26%	820.50	244	0
Enron	290.51	0	656,211,094.00	26%	847.55	2413	0
EUI Management	25.58	0	52,782,700.00	24%	836.52	169	0
FPL Corp.	341.24	0	933,410,257.00	31%	1,484.21	1256	0
GreenRidge	496.37	0	762,018,900.00	18%	623.45	4651	0
International Turbine Research	16.41	0	23,265,787.00	16%	437.72	167	0
Northwind	13.10	0	16,657,803.00	15%	420.08	189	0
San Gorgonio Farms, Inc.	33.14	0	106,372,946.00	37%	1,263.31	225	0
SeaWest Energy Group	110.57	0.9	278,142,109.50	29%	863.71	836	15
Southern California Sunbelt	11.01	0	17,001,666.00	18%	591.22	139	0
Westwind Association	16.21	0	32,413,381.00	23%	718.86	172	0
WindPower Partners 1993 LP	53.50	0	142,261,348.00	30%	1,231.94	190	0
Wintec	8.36	0	21,460,206.00	29%	834.18	147	0

## CHAPTER 7 OPERATOR DATA

### List of Wind Project Facilities

The following list includes the names and addresses of California wind projects reporting 2001 performance data to the WPRS program. The list is ordered by qualifying facility numbers assigned by the utilities (SCE – PG&E).

**TABLE #13**  
**2001 WIND PROJECT FACILITIES LISTING**

QFID	Utility	Project Name	City	Contact Street	Contact City	State	Zip
6004	SCE	Cabazon Power Partners, LLC	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6006	SCE	Mogul Energy Corp.	Tehachapi	P O Box 1332	Tehachapi	CA	93581
6007	SCE	Mesa Wind Developers	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6009	SCE	San Gorgonio Farms, Inc.	Whitewater	21515 Hawthorne Boulevard, Suite 1059	Torrance	CA	90503
6011	SCE	Windland, Inc.	Mojave	10901 Cameron Canyon Road	Mojave	CA	93501
6012	SCE	Windsong Energy, Inc.	Tehachapi	P. O. Box 1388	Tehachapi	CA	93581
6019	SCE	Oak Creek Trust-Zephyr Park Project	Mojave	4225 Executive Square	La Jolla	CA	92037
6024	SCE	Ridgetop Energy, LLC (I)	Mojave	10315 Oak Creek Road	Mojave	CA	93501
6029	SCE	CTV Management Group	Tehachapi	14961 Ballou Circle	Westminster	CA	92683
6030	SCE	LG&E Power, Inc.	Costa Mesa	575 Anton Boulevard, Suite 250	Costa Mesa	CA	92626
6031	SCE	EUI Management Ph, Inc.	West Conshohocken	100 Four Falls Corporate Center, Suite 21	West Conshohocken	CA	19428-2960
6035	SCE	LG&E Power, Inc.	Costa Mesa	575 Anton Boulevard, Suite 250	Costa Mesa	CA	92626
6037	SCE	Tehachapi Power Purchase Trust	Mojave	10315 Oak Creek Road	San Diego	CA	92108
6039	SCE	Victory Garden I	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6040	SCE	Victory Garden II	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6041	SCE	Victory Garden III	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6042	SCE	Victory Garden IV	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6043	SCE	Zond Windssystem Partners 85-A	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6044	SCE	Zond Windssystem Partners 85-B	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6051	SCE	Phoenix Energy Limited	North Palm Springs	1455 Frazee Road., 9th Floor	San Diego	CA	92108-4304
6052	SCE	NAWP Inc.	San Diego	1455 Frazee Road, 9th Floor	San Diego	CA	92108-4304
6053	SCE	FORAS Energy, Inc.	North Palm Springs	PO Box 581043	North Palm Springs	CA	92258
6055	SCE	CTV Management Group	Tehachapi	14961 Ballou Circle	Westminster	CA	92683
6056	SCE	Southern California Sunbelt Developers	Desert Hot Springs	3230 E. Imperial Highway, Suite 200	Brea	CA	92821
6057	SCE	c/o ESI Energy, Inc.	Mojave	10315 Oak Creek Road	Mojave	CA	93501
6058	SCE	San Gorgonio Westwinds II, LLC	North Palm Springs	1455 Frazee Road, Ninth Floor	San Diego	CA	92108-4304
6060	SCE	Calwind Resources, Inc.	Tehachapi	2659 Townsgate Road, Suite 122	Westlake Village	CA	91361
6061	SCE	Windridge, Inc.	Tehachapi	P. O. Box 1388	Tehachapi	CA	93581
6062	SCE	Energy Dev. & Construction	North Palm Springs	21515 Hawthorne Blvd, Suite 1059	Torrance	CA	90503
6063	SCE	c/o ESI Energy, Inc.	Mojave	10315 Oak Creek Road	Mojave	CA	93501
6064	SCE	San Gorgonio Farms, Inc.	Whitewater	21515 Hawthorne Boulevard, Suite 1059	Torrance	CA	90503
6065	SCE	Sky River Partnership (Wilderness I)	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6066	SCE	Sky River Partnership (Wilderness II)	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6067	SCE	Sky River Partnership (Wilderness III)	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6087	SCE	NAWP Inc.	North Palm Springs	1455 Frazee Road, 9th Floor	San Diego	CA	92108-4304
6088	SCE	FORAS Energy, Inc.	North Palm Springs	PO Box 581043	North Palm Springs	CA	92258
6089	SCE	CTV Management Group	Tehachapi	14961 Ballou Circle	Westminster	CA	92683
6090	SCE	FORAS Energy, Inc.	North Palm Springs	63-665 19th Avenue	North Palm Springs	CA	92258
6091	SCE	c/o ESI Energy, Inc.	Mojave	10315 Oak Creek Road	Mojave	CA	93501
6092	SCE	Cannon Energy Corporation	Mojave	10315 Oak Creek Road	Mojave	CA	93501
6094	SCE	SeaWest Industries, Inc	North Palm Springs	1455 Frazee Road., 9th Floor	San Diego	CA	92108-4304
6095	SCE	Dutch Energy Corporation	San Gorgonio Pass	1455 Frazee Road., 9th Floor	San Diego	CA	92108-4304
6096	SCE	EnXco	Palm Springs	125 E. Tahquitz Canyon Way, Suite 201	N. Palm Springs	CA	92262
6097	SCE	Windland, Inc.	Mojave	10901 Cameron Canyon Road	Mojave	CA	93501
6098	SCE	LG&E Power, Inc.	Costa Mesa	575 Anton Boulevard, Suite 250	Costa Mesa	CA	92626
6102	SCE	Victory Garden Phase IV Partner - 6102	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6103	SCE	Victory Garden Phase IV Partner - 6103	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6104	SCE	Victory Garden Phase IV Partner - 6104	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6105	SCE	Zond Systems, Inc. Monolith X	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6106	SCE	Zond Systems, Inc. Monolith XI	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6107	SCE	Zond Systems, Inc. Monolith XII	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6108	SCE	Zond Systems, Inc. Monolith XIII	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6111	SCE	Zond Systems Inc. Northwind	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6112	SCE	Painted Hills Wind Developers	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
6113	SCE	Desert Wind II PPC Trust	Mojave	10315 Oak Creek Road	Mojave	CA	93501
6114	SCE	Desert Wind III PPC Trust	Mojave	10315 Oak Creek Road	Mojave	CA	93501
6118	SCE	LG&E Power, Inc.	North Palm Springs	575 Anton Boulevard, Suite 250	Costa Mesa	CA	92626
6128	SCE	John W. Horton	Newberry Springs	47716 Fairview	Newberry Springs	CA	92365
6136	SCE	S & L Ranch	Frazier Park	2500 Johnson Road	Frazier Park	CA	93225
6139	SCE	Antelope Valley Calif. Poppy Reserve	Lancaster	43779 15th Street West	Lancaster	CA	93534
6213	SCE	Wintec Energy, Ltd.	Palm Springs	125 E. Tahquitz Canyon Way, Suite 201	Palm Springs	CA	92262
6234	SCE	Oak Creek Energy Systems Inc.	Mojave	1455 Frazee Road, #900	San Diego	CA	92108
6236	SCE	Calwind Resources, Inc.	Tehachapi	2659 Townsgate Road, Suite 122	Westlake Village	CA	91361
C2011	SCE	Mountain View I	San Gorgonio Pass	1455 Frazee Road, 9th Floor	San Diego	CA	92108-4304
C2012	SCE	Mountain View II	San Gorgonio Pass	1455 Frazee Road, 9th Floor	San Diego	CA	92108-4304

## 2001 WIND PROJECT FACILITIES LISTING (Con't)

01W004	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
01W018	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
01W035	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
01W144	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
01W146A	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
01W146B	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
01W146C	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
01W146D	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
01W146D	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
06W146A	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
06W146B	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
06W146C	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
06W146D	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
06W148	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
16W011	PG&E	Altamont Infrastructure Company - 01W004	Livermore	6185 Industrial Way	Livermore	CA	94550
16W009	PG&E	Altamont Midway, LTD.	Tracy	1455 Frazee Rd. Suite 900	San Diego	CA	92108
01W011	PG&E	Altech I	Tracy	1455 Frazee Rd. Suite 900	San Diego	CA	92108
1W006H	PG&E	Dyer Road	Tracy	1455 Frazee Rd. Suite 900	San Diego	CA	92108
01W007	PG&E	Zond Windsystem Partners LTD Series 85-C	Tehachapi	13000 Jameson Rd	Tehachapi	CA	93561
01W009,		Flowind I (Dyer Road)--Flowind Partners1,					
16W010	PG&E	Flowind Partners 2	Livermore	6185 Industrial Way	Livermore	CA	94550
16W014,							
16W015,							
16W016,		Flowind II(Elworthy)-Flowind 3-4,Flowind 4-4,					
16W017	PG&E	Flowind5-4, And Flowind 6-4	Livermore	6185 Industrial Way	Livermore	CA	94550
25W105	PG&E	International Turbine Research, Inc	Hollister	P O Box 96	Hollister	CA	95024
01W095	PG&E	Northwind Vaquero-Souza Windpark	Palm Springs	125 E. Tahquitz Canyon Way, Suite 201	Palm Springs	CA	92262
16W028	PG&E	Patterson Pass Wind Farm	Tracy	Four Embarcadero Center, Suite 4000	San Francisco	CA	94111-4106
01W006	PG&E	SWEG (Seawest Energy Group)	Tracy	1455 Frazee Rd. Suite 900	San Diego	CA	92108
01W015	PG&E	Taxvest 11	Tracy	1455 Frazee Rd. Suite 900	San Diego	CA	92108
01W094	PG&E	Tres Vaqueros Windfarms, LLC	North Palm Springs	P O Box 1043	North Palm Springs	CA	92258
01W012	PG&E	Venture Winds	Tracy	1455 Frazee Rd. Suite 900	San Diego	CA	92108
01W014	PG&E	Viking 83	Tracy	1455 Frazee Rd. Suite 900	San Diego	CA	92108
01W001	PG&E	Winddriven, Inc.	Byron	PO Box 645 7601 Byron Hotsprings Rd	Byron	CA	94514-0645
01W017	PG&E	Zond Windsystem Partners LTD Series 85-C	Livermore	P O Box 1910	Tehachapi	CA	93581

## Performance Data by Wind Projects

This section contains performance data, as submitted by California wind project operators, for the four quarters in 2001. The data are listed alphabetically by operator name. Under each operator, reporting projects are identified along with qualifying facility Ids (QFID), capacities, wind turbine models, number of turbines, and production figures for the year. An asterisk next to the QF facilities indicates that some portion of the data was incomplete. As of 2000, the Commission assigned identification numbers (CECID) are given to new facilities that come on line under the Commission's new accounts program. These facilities will not have the traditional QFIDs and will use the CECIDs for future reference. Commission's Ids track the year in which the facility came on line, utility service area and is followed by a number indicating its sequence during the year (for example: CECID = C2001; C = Commission ID; 1,2 or 3 = PG&E, SCE or other utility service area; YY = year facility came on line, Seq # = facility sequence number the year it begins generation.)

The data contained in this report represent performance results from 2000-2001, with details for 2001 presented. Because of the market volatility during this period, the data from any one-year should not be used as the sole basis for evaluating overall wind project performance in the state.

### Section Notes

These notes describe how the WPRS data are reported and calculated. Points of clarification and limitations of the data are also discussed. The definitions for most wind data categories in this section are contained in WPRS regulations (Appendix D).

**Data missing** Some operators submitted incomplete reporting forms. Items not completed are designated by "N/A" or dashes (---) to distinguish missing data from

values of “0.” Note that operators who submit reports with missing data are in violation of WPRS regulations.

**Failed to File** The Commission staff identified wind project operators who did not submit performance data but according to utility reports should have participated in the WPRS program. Subsequently, the Commission staff notified non-reporting operators by mail of the WPRS requirements. Non-reporting operators who were notified but did not respond were noted as “failed to file.”

**Electricity Produced** Individual turbine model outputs, submitted by wind operators, are included for each month along with monthly and annual total. An annual total for the entire project follows. Individual turbine model outputs may not always equal the total project output because individual turbine production is usually read from meters owned by project operators, while total project output is measured from utility substation meters. Line losses and calibration differences between meters account for some of these differences.

**Other Participant(s)** In some cases, participants, in addition to the listed project operator, may be involved in a project. These participants could include project managers, joint venture partners, wind developers using another developer’s site, etc.

**Rotor (M<sup>2</sup>)** The diameter of the rotor-swept area for each wind turbine allows different wind systems to be compared independently of wind resource area. In theory, the power available for any wind turbine is proportional to the square of the diameter of the rotor-swept area. Thus, doubling the size of the rotor diameter should increase the power output by a factor of four.

**Size (Kw)** For each turbine model listed, the Kw size rating is followed by a miles per hour (mph) specification. Because a standardized rating method does not exist, these mph specifications vary widely for different turbine models.

## 2001 WIND PROJECT PERFORMANCE REPORTING DATA

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# 2001 WIND PROJECT PERFORMANCE REPORTING DATA

Zond Systems Inc Monolith XI	6106	0.13 Vestas V-15	2	2	2	2	56,880.00	112,030.00	79,150.00	40,000.00	288,060.00		
	6106	4.86 Vestas V-17	54	54	54	54	2,012,600.00	3,920,670.00	2,427,490.00	1,941,530.00	10,302,290.00		
	6107	0.20 Vestas V-15	3	3	3	3	75,580.00	169,960.00	90,830.00	54,560.00	390,930.00		
	6107	4.23 Vestas V-17	47	47	47	47	1,741,460.00	3,253,910.00	2,047,580.00	1,609,020.00	8,651,970.00		
	6107	Zond Systems Inc Monolith XII	13	13	13	13	501,030.00	926,840.00	562,250.00	446,140.00	2,436,260.00		
	6107	1.17 Vestas V-17E	5	5	5	5	573,720.00	956,840.00	577,690.00	532,790.00	2,641,040.00		
	6108	2.25kW@35MPH	62	62	62	62	1,929,050.00	3,764,600.00	2,310,780.00	1,961,860.00	9,966,280.00		
	6108	5.68 Vestas V-17	39	39	39	39	798,960.00	1,420,120.00	699,020.00	471,460.00	3,359,480.00		
	6111	Zond Systems Inc-Northwind	41	41	41	41	1,253,610.00	2,269,510.00	1,210,150.00	893,280.00	5,626,550.00		
	6111	3.69 Vestas V-17	1	1	1	1	32,180.00	15,930.00	45,430.00	21,320.00	114,860.00		
	6111	0.09 Vestas V-17E	59	59	59	59	1,337,670.00	3,086,100.00	2,121,410.00	1,112,250.00	7,657,430.00		
	6112	3.84 Vestas V-15	169	169	169	169	4,634,960.00	10,804,010.00	7,171,875.00	3,876,097.00	26,486,942.00		
	6112	15.21 Vestas V-17									612,521,561.70		
EUI Management PH Inc.													
Project Name	QFID	Net Cap Committed (MW)	Models	Wind Speed	# of Turbines Q1	# of Turbines Q2	# of Turbines Q3	# of Turbines Q4	Energy Produced in (kWh) Q1	Energy Produced in (kWh) Q2	Energy Produced in (kWh) Q3	Energy Produced in (kWh) Q4	Annual Energy Produced
Mountain PassB5 Ltd	6031	4.23 Bonus 65		65kW@40MPH	61	65	65	65	1,324,494.90	2,841,966.80	1,986,590.90	1,047,045.90	7,180,050.50
Mountain PassB5 Ltd	6031	7.68 Bonus 120		120kW@40MPH	64	64	64	64	2,167,977.90	4,885,782.90	3,367,231.80	1,810,636.90	12,231,628.50
Mountain PassB5 Ltd	6031	0.75 Delta 150		150kW@40MPH	5	5	5	5	75,423.00	99,588.90	85,953.00	124,959.90	366,924.80
Mountain PassB5 Ltd	6031	2.81 Micon 108		108kW@32MPH	26	26	26	26	1,221,574.80	1,962,445.80	1,384,395.90	861,462.00	5,429,878.50
Mountain PassB5 Ltd	6031	0.25 Bonus 250		250kW@32MPH	1	1	1	1	123,078.90	257,590.80	108,261.00	-	488,930.70
Mountain PassB5 Ltd	6031	10.00 Nordex 1000		1000kW@30MPH	10	10	10	10	4,895,629.80	7,133,362.00	6,368,662.80	3,068,517.00	21,456,161.60
FPL Inc.													
Project Name	QFID	Net Cap Committed (MW)	Models	Wind Speed	# of Turbines Q1	# of Turbines Q2	# of Turbines Q3	# of Turbines Q4	Energy Produced in (kWh) Q1	Energy Produced in (kWh) Q2	Energy Produced in (kWh) Q3	Energy Produced in (kWh) Q4	Annual Energy Produced
Phase 3, 4A, 4B	6024	15.00 Nordtank 150 kW		150kW@42MPH	100	100	100	100	4,819,819.00	9,151,328.00	5,339,220.00	4,168,453.60	23,478,820.60
Phase 3, 4A, 4B	6024	17.10 Nordtank 75		75kW@42MPH	228	228	228	228	6,100,161.00	10,786,097.00	7,457,707.00	5,118,067.40	29,462,032.40
Phase 3, 4A, 4B	6024	0.32 Micon 108 kW		108kW@33MPH	3	3	3	3	176,478.00	404,840.00	282,253.00	186,066.20	1,049,637.20
Phase 3, 4A, 4B	6024	0.25 Micon 250 kW		250kW@33MPH	1	1	1	1	118,192.00	218,388.00	135,238.00	107,347.20	579,165.20
Phase 3, 4A, 4B	6024	32.34 V47		660kW@33MPH	49	49	49	49	20,263,500.00	35,645,562.00	25,093,074.00	17,181,042.00	98,172,678.00
Cannon EnergyPhase 5	6092	0.86 Micon 108 kW		108kW@33MPH	8	8	8	8	366,764.00	715,134.00	523,472.00	311,095.00	1,936,465.00
Cannon EnergyPhase 5	6092	12.60 Vestas V39		460kW@30MPH	28	28	28	28	7,667,559.00	13,899,849.00	9,309,611.00	6,028,868.00	36,906,877.00
Cannon EnergyPhase 5	6092	14.52 V47		660kW@33MPH	22	22	22	22	9,234,261.00	16,912,679.00	11,817,002.00	7,709,703.00	45,673,645.00
FlowWind III	6067	43.40 NEG MICON 700		700kW@33MPH	62	62	62	62	26,360,198.20	46,266,245.75	33,570,211.60	21,292,211.70	127,478,867.25
FlowWind III	6067	3.67 Micon 108 kW		108kW@33MPH	34	34	34	34	1,660,655.00	2,137,221.00	1,881,332.00	1,044,096.00	5,923,258.00
Desert Wind II	6063	45.60 MHI 250		250kW@33MPH	182	182	182	182	15,718,063.00	34,101,217.00	21,857,349.00	15,644,444.00	87,121,073.00
Desert Wind II	6063	2.40 MHI 600		600kW@33MPH	4	4	4	4	1,317,899.00	2,269,472.00	2,114,602.00	1,294,501.00	7,016,274.00
Desert Wind II	6113	75.00 MHI 250		250kW@33MPH	300	300	300	300	37,700,993.00	81,019,641.00	62,901,893.00	37,552,434.00	219,174,561.00
Desert Wind II	6114	21.25 MHI 250		250kW@33MPH	85	85	85	85	6,632,519.00	13,350,770.00	7,237,908.00	7,260,046.00	34,501,243.00
Desert Wind III	6114	15.60 MHI 600		600kW@33MPH	26	26	26	26	7,862,690.00	13,861,944.00	10,564,191.00	7,674,130.00	39,972,965.00
Cameron Ridge LLC (IV)	6091	11.90 NEG MICON 700		700kW@33MPH	17	17	17	17	6,863,180.10	12,361,663.83	8,935,742.80	5,727,932.40	33,876,518.93
Cameron Ridge LLC (IV)	6091	0.76 Micon 108 kW		108kW@33MPH	7	7	7	7	179,881.00	458,860.00	271,432.00	183,650.00	1,093,813.00
Tehachapi Power Purchase Contract Trust	6037	11.36 Danwin 160		160kW@33MPH	71	71	71	71	4,081,096.00	8,193,147.00	6,196,624.00	3,597,195.00	22,069,052.00
Tehachapi Power Purchase Contract Trust	6037	17.40 NHI 600		600kW@33MPH	29	29	29	29	9,316,671.00	18,546,394.00	14,772,739.00	8,339,669.00	50,975,473.00
866,451,418.59													
Altamont Power Windplant													
Project Name	QFID	Net Cap Committed (MW)	Models	Wind Speed	# of Turbines Q1	# of Turbines Q2	# of Turbines Q3	# of Turbines Q4	Energy Produced in (kWh) Q1	Energy Produced in (kWh) Q2	Energy Produced in (kWh) Q3	Energy Produced in (kWh) Q4	Annual Energy Produced
FlowWind I (Oyer Road)	N/A	14.16 F-17		143kW@44MPH	99	99	99	99	761,930.80	1,868,566.80	3,222,529.80	683,325.00	6,536,342.40
FlowWind I (Oyer Road)	N/A	4.75 F-19		250kW@36MPH	19	19	19	19	165,337.00	464,722.00	1,079,505.90	161,025.90	1,910,590.80
FlowWind II (Elworthy)	N/A	2.75 D-110		110kW@33MPH	25	25	25	25	153,166.90	343,818.90	452,844.00	35,836.90	986,664.70
Bonus Mark II H23	N/A	26.66 B-120		118.5kW@29MPH	225	225	225	225	7,201,771.80	20,300,836.00	28,915,726.80	6,905,887.80	63,324,221.40
Bonus Mark II H24	N/A	15.00 B-150		150kW@29MPH	100	100	100	100	4,159,599.00	11,201,130.90	15,028,335.00	3,689,151.00	34,078,215.90
106,635,036.20													
Green Ridge													

## 2001 WIND PROJECT PERFORMANCE REPORTING DATA

[illegible]

# 2001 WIND PROJECT PERFORMANCE REPORTING DATA

San Gorgonio Farms												
Project Name	Net Cap Committed (MW)	Models	Wind Speed	# of Turbines Q1	# of Turbines Q2	# of Turbines Q3	# of Turbines Q4	Energy Produced in (kWh) Q1	Energy Produced in (kWh) Q2	Energy Produced in (kWh) Q3	Energy Produced in (kWh) Q4	Annual Energy Produced
Energy Development & Const. Corp.	3.00	Vestas V-39 500 kW	500kW@30MPH	6	6	6	6	1,337,842.00	3,020,889.00	2,259,500.00	1,102,732.00	7,720,963.00
San Gorgonio Wind Farms Inc I	2.73	Bonus 65 kW	65kW@33MPH	42	42	42	42	1,535,720.00	3,342,060.00	2,421,850.00	1,289,710.00	8,599,340.00
Whitewater Hill 28	0.30	Micon 60 kW	60kW@33MPH	5	5	5	5	239,440.00	464,890.00	328,870.00	185,200.00	1,218,400.00
Whitewater Hill 28	2.47	Bonus 65 kW	65kW@33MPH	38	38	38	38	1,108,820.00	2,424,070.00	1,805,780.00	926,880.00	6,265,560.00
Whitewater Hill 28	2.47	Micon 65 kW	65kW@33MPH	38	38	38	38	1,108,820.00	2,434,105.00	1,746,740.00	907,603.00	6,196,626.00
Whitewater Hill 28	0.12	Bonus 120 kW	120kW@40MPH	1	1	1	1	70,270.00	49,980.00	99,960.00	60,270.00	280,380.00
Whitewater Hill 28	5.50	Bonus 120 kW	100kW@28MPH	55	55	55	55	3,300,590.00	7,340,320.00	5,444,600.00	2,669,770.00	18,754,280.00
Whitewater Hill 28	13.60	DWT Windane 34	400kW@30MPH	34	34	34	34	8,559,440.00	16,677,480.00	13,539,440.00	6,974,320.00	45,749,240.00
Whitewater Hill 28	0.45	Bonus 450	450kW@30MPH	1	1	1	1	251,680.00	268,480.00	422,880.00	159,640.00	1,101,680.00
Whitewater Hill 28	2.50	Vestas V-39 500 kW	500kW@30MPH	5	5	5	5	1,523,640.00	2,981,360.00	2,373,840.00	1,247,440.00	8,126,280.00
104,002,949.00												
SeaWest Energy Group												
Project Name	Net Cap Committed (MW)	Models	Wind Speed	# of Turbines Q1	# of Turbines Q2	# of Turbines Q3	# of Turbines Q4	Energy Produced in (kWh) Q1	Energy Produced in (kWh) Q2	Energy Produced in (kWh) Q3	Energy Produced in (kWh) Q4	Annual Energy Produced
Westwinds II/Phoenix Section 20 Trust	10.10	Micon 700	631kW@30MPH	16	16	16	16	6,789,145.00	13,927,083.00	10,077,808.00	6,202,104.00	36,996,140.00
NAWAP Inc. [East Winds Proj]	3.99	Micon 600	570kW@30MPH	7	7	7	7	1,769,715.00	4,056,993.00	3,141,927.00	1,557,990.00	10,526,625.00
Windstries-Section 16-21 PPA Trust	8.83	Micon 700	631kW@30MPH	14	14	14	14	6,307,475.00	11,731,764.00	9,586,554.00	4,428,552.00	32,054,346.00
VPI Enterprises-Altech (II) Section 16-29 Trust	21.71	Micon 108	108kW@30MPH	201	201	201	201	6,250,929.00	18,582,343.00	790,694.00	1,064,620.00	26,688,586.00
VPI Enterprises-Altech (III) Section 16-29 Trust	3.18	Micon 65/13	60kW@30MPH	53	53	53	53	1,103,105.00	3,279,237.00	139,534.00	187,874.00	4,709,750.00
VPI Enterprises-Altech (III) Section 16-29 Trust	8.83	Micon 700	631kW@30MPH	14	14	14	14	4,392,310.00	10,472,324.00	596,531.00	715,913.00	16,177,078.00
San Jacinto Power Section 22 Trust	7.80	Vangrid 95T	195kW@30MPH	40	40	40	40	556,764.00	1,463,957.00	1,619,665.50	689,875.00	4,330,261.50
San Jacinto Power Section 22 Trust	2.54	Windmatic 15S	195kW@30MPH	13	13	13	13	556,764.00	1,463,957.00	1,619,665.50	689,875.00	4,330,261.50
San Jacinto Power Section 22 Trust	11.95	Micon 700	654kW@30MPH	18	18	18	18	5,905,056.00	13,161,080.00	11,128,503.00	5,205,574.00	35,400,213.00
Dutch Energy	9.42	Nedwind 40	471kW@30MPH	20	20	20	20	3,176,178.00	8,375,538.00	8,318,810.00	3,196,350.00	23,068,876.00
Mountain View II	44.40	Mitsubishi 600	600kW@30MPH	0	0	74	74	-	8,375,538.00	5,218,155.00	24,249,240.00	29,467,395.00
Mountain View II	22.20	Mitsubishi 600	600kW@30MPH	0	0	37	37	-	-	5,218,155.00	11,866,514.00	11,866,514.00
Sea West Energy (Seawest - 01W006)	0.01	Micon 65/13	13kW@LOW Sp.	1	1	1	1	10,255.00	20,837.00	27,236.00	9,023.00	67,351.00
Sea West Energy (Seawest - 01W006)	0.90	Micon 65/13	60kW@30MPH	0	15	15	15	1,609,023.00	5,894,918.00	7,725,080.00	966,235.00	16,196,256.00
Sea West Energy (CWES - 01W007)	1.10	ESI 54	50kW@30MPH	22	22	22	22	3,448.00	431,483.00	718,947.00	128,036.00	1,281,914.00
Sea West Energy (Atech - 01W011)	5.76	ETK 44/40	40kW@30MPH	144	144	144	144	438,523.00	2,726,894.00	5,240,139.00	763,914.00	9,169,470.00
Sea West Energy (Western - 01W012)	2.47	Windmatic	65kW@35MPH	38	38	38	38	196,454.00	1,159,054.00	1,429,860.00	260,965.00	3,046,363.00
Sea West Energy (Viking - 01W014)	0.34	Micon 65/13	13kW@LOW Sp.	26	26	26	26	218,597.00	934,747.00	1,529,639.00	299,688.00	3,082,651.00
Sea West Energy (Tavest - 01W015)	11.64	Micon 65/13	60kW@30MPH	194	194	194	194	147,952.00	664,835.00	1,074,278.00	135,479.00	2,022,544.00
270,471,595.00												
Southern California Sunbelt Developers, Inc.												
Project Name	Net Cap Committed (MW)	Models	Wind Speed	# of Turbines Q1	# of Turbines Q2	# of Turbines Q3	# of Turbines Q4	Energy Produced in (kWh) Q1	Energy Produced in (kWh) Q2	Energy Produced in (kWh) Q3	Energy Produced in (kWh) Q4	Annual Energy Produced
Palm Springs Wind Park	6.27	Windmatic 17's	95kW@34MPH	66	66	66	66	1,272,273.00	3,897,625.00	2,174,470.80	1,360,354.00	8,724,922.80
Palm Springs Wind Park	4.75	Windmatic 15's	65kW@31.5MPH	73	73	73	73	986,494.80	3,157,770.00	1,736,677.80	746,709.00	6,627,651.60
15,352,574.40												
BNY Western Trust Company												
Project Name	Net Cap Committed (MW)	Models	Wind Speed	# of Turbines Q1	# of Turbines Q2	# of Turbines Q3	# of Turbines Q4	Energy Produced in (kWh) Q1	Energy Produced in (kWh) Q2	Energy Produced in (kWh) Q3	Energy Produced in (kWh) Q4	Annual Energy Produced
WestWind Assoc. Windpark	2.48	Wincon 108kW	108kW@33MPH	23	23	23	23	461,834.30	1,253,152.40	835,179.50	424,733.50	2,974,899.70
WestWind Assoc. Windpark	9.24	Wincon XT 110kW	110kW@33MPH	84	84	84	84	2,773,714.70	6,567,655.80	4,337,616.10	2,321,735.00	16,000,721.60
WestWind Assoc. Windpark	1.40	Micon 108kW	108kW@33MPH	13	13	13	13	330,166.70	865,477.50	530,192.30	260,901.90	1,996,736.40
WestWind Assoc. Windpark	2.99	Micon 65kW	65kW@33MPH	46	46	46	46	1,084,862.10	2,532,617.90	1,701,259.60	907,300.90	6,226,040.50
WestWind Assoc. Windpark	0.85	Nordtank 65kW	65kW@34MPH	13	13	13	13	318,166.20	767,360.40	514,660.50	264,780.70	1,884,967.80
29,083,388.00												

## 2001 WIND PROJECT PERFORMANCE REPORTING DATA

WindPower Partners 1993, L.P.													
Project Name	QFID	Net Cap Committed (MW)	Models	Wind Speed	# of Turbines Q1	# of Turbines Q2	# of Turbines Q3	# of Turbines Q4	Energy Produced in (kWh) Q1	Energy Produced in (kWh) Q2	Energy Produced in (kWh) Q3	Energy Produced in (kWh) Q4	Annual Energy Produced
Buck Substation	6030	18.00 KYS-33		400-410 kW@35MPH	45	45	45	45	8,251,142.00	16,244,387.00	12,360,168.00	6,245,085.00	43,100,782.00
Whitewater Substation	6036	7.60 KYS-33		400-410 kW@35MPH	19	19	19	19	4,063,766.00	7,998,345.00	5,707,734.00	3,668,839.00	21,438,684.00
Aldrich Substation	6098	2.40 KYS-33		400-410 kW@35MPH	6	6	6	6	953,748.00	2,000,461.00	1,300,934.00	597,890.00	4,933,033.00
Riverview Substation	6118	7.50 Kenetech 56-100		100kW@29MPH	75	75	75	75	3,132,899.00	6,000,962.00	4,977,280.00	2,360,013.00	16,471,154.00
Carter/Triad Substation	6213	6.40 KYS-33		400-410 kW@35MPH	16	16	16	16	4,011,256.00	7,311,773.00	5,824,349.00	3,346,301.00	20,493,679.00
Carter/Triad Substation	6213	5.20 KYS-33		400-410 kW@35MPH	13	13	13	13	1,900,086.00	6,807,750.00	2,616,075.00	1,428,636.90	12,752,559.90
Carter/Triad Substation	6213	6.40 KYS-33		400-410 kW@35MPH	16	16	16	16	2,495,826.00	5,172,198.00	4,141,263.00	2,069,127.00	13,878,414.00
BNY Western Trust Company													
													133,068,306.90
Project Name	QFID	Net Cap Committed (MW)	Models	Wind Speed	# of Turbines Q1	# of Turbines Q2	# of Turbines Q3	# of Turbines Q4	Energy Produced in (kWh) Q1	Energy Produced in (kWh) Q2	Energy Produced in (kWh) Q3	Energy Produced in (kWh) Q4	Annual Energy Produced
Wintec I WindPark	6213	0.18 Carter 25kW		25kW@26MPH	7	7	7	7	49,581.00	172,460.50	129,674.30	17,191.60	368,907.40
Wintec I (171) Windpark	6213	0.04 AASI 40kW		40kW@30MHP	1	1	1	1	14,819.90	29,265.60	33,376.90	10,043.80	87,506.20
Wintec I (171) Windpark	6213	0.26 AASI 20kW		20kW@26MPH	13	13	13	13	74,166.00	302,053.70	217,021.60	88,097.10	681,348.40
Wintec Palm Windpark	6213	2.67 Micon 65kW		65kW@34MPH	41	41	41	41	1,123,293.50	2,442,095.00	1,911,521.80	934,734.30	6,411,645.60
Wintec Cahulla Windpark	6213	4.94 Nordtank 65kW		65kW@34MPH	76	76	76	76	2,274,773.30	5,263,743.00	4,185,409.40	2,078,714.90	13,822,640.60
FAIL TO FILE													
Howden (Tres Vaqueros)													21,372,048.20
Winddnen LLC													
Windland Inc.													

## **APPENDICES**

**Appendix A** contains a listing of turbine manufacturers and references to wind facilities utilizing their model of turbines (referenced by QF numbers and CECID numbers).

**Appendix B** identifies sources of wind energy technical assistance available to California project proponents.

**Appendix C** contains the current WPRS data reporting template used by operators. This section will also be reserved for comments made by wind operators detailing maintenance and operation issues through the year.

**Appendix D** contains WPRS regulations which provide definitions for most wind categories used in this report.

## APPENDIX A: TURBINE MANUFACTURERS AND FACILITIES

TURBINE MANUFACTURER	COUNTRY OF ORIGIN	TURBINE MODEL	PROJECT OPERATOR	QFID
Alaska Applied Sciences	USA	AASI 40kW	Wintec	6213
Alaska Applied Sciences	USA	AASI 20kW	Wintec	6213
American M.A.N.	Germany	Aeroman 12.5/Series 1	Coram	6029
American M.A.N.	Germany	Aeroman 12.5/Series 2	Coram	6029
American M.A.N.	Germany	Aeroman 12.5/Series 2	Coram	6055
American M.A.N.	Germany	Aeroman 12.5/Series 1	Coram	6089
Bonus Energy A/S	Denmark	B-120	GreenRidge	16W014,16W015, 16W016,16W017, 01W009,16W010
Bonus Energy A/S	Denmark	B-150	GreenRidge	16W014,16W015, 16W016,16W017, 01W009,16W010
Bonus Energy A/S	Denmark	Bonus	GreenRidge	?
Bonus Energy A/S	Denmark	Bonus 65/13	Calwind Rosources, Inc.	6236
Bonus Energy A/S	Denmark	Bonus 65	EUI Management	6031
Bonus Energy A/S	Denmark	Bonus 120	EUI Management	6031
Bonus Energy A/S	Denmark	Bonus 250	EUI Management	6031
Bonus Energy A/S	Denmark	Bonus 65 kW	San Gorgonio Farms, Inc.	6009
Bonus Energy A/S	Denmark	Bonus 65 kW	San Gorgonio Farms, Inc.	6064
Bonus Energy A/S	Denmark	Bonus 120 kW	San Gorgonio Farms, Inc.	6064
Bonus Energy A/S	Denmark	Bonus 120 kW	San Gorgonio Farms, Inc.	6064
Bonus Energy A/S	Denmark	Bonus 450	San Gorgonio Farms, Inc.	6064
Carter Wind Systems	USA	Carter 25kW	Wintec	6213
Danwin A/S	Denmark	Danwin 160	FPL Corp.	6037
Danwin A/S	Denmark	Nedwind 40	SeaWest Energy Group	6095
Danwin A/S	Denmark	D-110	GreenRidge	16W014,16W015, 16W016,16W017, 01W009,16W010
Delta	Unknown	Delta 150	EUI Management	6031
Energy Sciences, Inc	USA	ESI 54	SeaWest Energy Group	01W007
Enertech	USA	ETK 44/40	SeaWest Energy Group	6058
Enertech	USA	ETK 44/40	SeaWest Energy Group	6051
Enertech	USA	ETK 44/40	SeaWest Energy Group	01W011
Enron Wind Corp.	USA	EW-750	Enron	6004
FloWind Corp.	USA	F-17	GreenRidge	16W014,16W015, 16W016,16W017, 01W009,16W010
FloWind Corp.	USA	F-19	GreenRidge	16W014,16W015, 16W016,16W017, 01W009,16W010
James Howden and Company	Scotland	Howden 330kW	Northwind	01W095

## APPENDIX A (Con't)

				01W004, 01W018, 01W035, 01W144, 01W146A, 01W146B, 01W146C, 01W146D, 06W146A, 06W146B, 06W146C, 06W146D, 06W148, 16W011
Kenetech Windpower Inc	USA	KCS-56	GreenRidge	
				01W004, 01W018, 01W035, 01W144, 01W146A, 01W146B, 01W146C, 01W146D, 06W146A, 06W146B, 06W146C, 06W146D, 06W148, 16W011
Kenetech Windpower Inc	USA	KVS-33	GreenRidge	06W148
Kenetech Windpower Inc	USA	KCS-56	GreenRidge	06W148
Kenetech Windpower Inc	USA	KVS-33	GreenRidge	?
Kenetech Windpower Inc	USA	KCS-56	GreenRidge	6030
Kenetech Windpower Inc	USA	KVS-33	WindPower Partners 1993 LP	6035
Kenetech Windpower Inc	USA	KVS-33	WindPower Partners 1993 LP	6098
Kenetech Windpower Inc	USA	KVS-33	WindPower Partners 1993 LP	6098
Kenetech Windpower Inc	USA	KCS-56	WindPower Partners 1993 LP	6118
Kenetech Windpower Inc	USA	KVS-33	WindPower Partners 1993 LP	6213
Kenetech Windpower Inc	USA	KVS-33	WindPower Partners 1993 LP	6213
Mitsubishi Power Systems,	Japon	Mitsubishi 600	SeaWest Energy Group	C2011
Mitsubishi Power Systems,	Japon	Mitsubishi 600	SeaWest Energy Group	C2012
Moerup Manufacturing Co.	Denmark	Micon 600	SeaWest Energy Group	6052
Moerup Manufacturing Co.	Denmark	Micon 108 kW	Difwind Farms	
Moerup Manufacturing Co.	Denmark	Micon 108	SeaWest Energy Group	6087
Moerup Manufacturing Co.	Denmark	Micon 65/13	SeaWest Energy Group	6087
Moerup Manufacturing Co.	Denmark	Micon 700	SeaWest Energy Group	6087
Moerup Manufacturing Co.	Denmark	Micon 700	SeaWest Energy Group	6058
Moerup Manufacturing Co.	Denmark	Micon 700	SeaWest Energy Group	6094
Moerup Manufacturing Co.	Denmark	Micon 65/13	SeaWest Energy Group	6051
Moerup Manufacturing Co.	Denmark	Micon 700	SeaWest Energy Group	6051
Moerup Manufacturing Co.	Denmark	Micon 108 kW	Difwind Farms	6088
Moerup Manufacturing Co.	Denmark	Micon 65 kW	Difwind Farms	6088
Moerup Manufacturing Co.	Denmark	Micon 65/13	SeaWest Energy Group	01W014
Moerup Manufacturing Co.	Denmark	Micon 65/13	SeaWest Energy Group	01W006
Moerup Manufacturing Co.	Denmark	Micon 65/13	SeaWest Energy Group	01W015
Moerup Manufacturing Co.	Denmark	Micon 108	EUI Management	6031
Moerup Manufacturing Co.	Denmark	Micon 65kW	Wintec	6213
Moerup Manufacturing Co.	Denmark	Micon 108kW	Westwind Association	6096
Moerup Manufacturing Co.	Denmark	Micon 65kW	Westwind Association	6096
Moerup Manufacturing Co.	Denmark	Micon 108 kW	FPL Corp.	6024
Moerup Manufacturing Co.	Denmark	Micon 250 kW	FPL Corp.	6024
Moerup Manufacturing Co.	Denmark	Micon 108 kW	FPL Corp.	6092
Moerup Manufacturing Co.	Denmark	Micon 108 kW	FPL Corp.	6057
Moerup Manufacturing Co.	Denmark	Micon 108 kW	FPL Corp.	6091
Moerup Manufacturing Co.	Denmark	Micon 60 kW	San Gorgonio Farms, Inc.	6009
Moerup Manufacturing Co.	Denmark	Micon 60 kW	San Gorgonio Farms, Inc.	6064
Nagasaki Shipyard and M	Japan	MHI 600	FPL Corp.	6037
Nagasaki Shipyard and M	Japan	MHI 250	FPL Corp.	6063
Nagasaki Shipyard and M	Japan	MHI 600	FPL Corp.	6063
Nagasaki Shipyard and M	Japan	MHI 250	FPL Corp.	6113
Nagasaki Shipyard and M	Japan	MHI 250	FPL Corp.	6114
Nagasaki Shipyard and M	Japan	MHI 600	FPL Corp.	6114

## APPENDIX A (Con't)

NedWind ab.	Netherlands	Nedwind 40	SeaWest Energy Group	6095
NEG Micon A/S	Denmark	NEG MICON 700	FPL Corp.	6057
NEG Micon A/S	Denmark	NEG MICON 700	FPL Corp.	6091
Nordex Wind Turbines	Germany	Nordex 1000	EUI Management	6031
Nordtank Energy Group	Denmark	Nordtank 65/13	Calwind Rosources, Inc.	6060
Nordtank Energy Group	Denmark	Nordtank NKT 65	International Turbine Re	25W105
Nordtank Energy Group	Denmark	Nordtank 500	International Turbine Re	25W105
Nordtank Energy Group	Denmark	Nordtank 65kW	Wintec	6213
Nordtank Energy Group	Denmark	Nordtank 65kW	Westwind Association	6096
Nordtank Energy Group	Denmark	Nordtank 65kW	Northwind	01W095
Nordtank Energy Group	Denmark	Nordtank 150 kW	FPL Corp.	6024
Nordtank Energy Group	Denmark	Nordtank 75	FPL Corp.	6024
Nordtank Energy Group	Denmark	Nordtank 65 kW	FPL Corp.	6024
Vanguard	USA	Vangrd 95T	SeaWest Energy Group	6094
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	01W017
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6007
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6039
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6040
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6041
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6041
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6042
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6042
Vestas Wind Systems A/S	Denmark	Vestas V-23	Zond	6042
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6043
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6043
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6044
Vestas Wind Systems A/S	Denmark	Vestas V-27	Zond	6065
Vestas Wind Systems A/S	Denmark	Vestas V-27	Zond	6066
Vestas Wind Systems A/S	Denmark	Vestas V-27	Zond	6067
Vestas Wind Systems A/S	Denmark	Vestas V-27	Zond	6102
Vestas Wind Systems A/S	Denmark	Vestas V-27	Zond	6103
Vestas Wind Systems A/S	Denmark	Vestas V-27	Zond	6104
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6105
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6106
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6106
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6107
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6107
Vestas Wind Systems A/S	Denmark	Vestas V-17E	Zond	6107
Vestas Wind Systems A/S	Denmark	Vestas V-27	Zond	6107
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6108
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6111
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6111
Vestas Wind Systems A/S	Denmark	Vestas V-17E	Zond	6111
Vestas Wind Systems A/S	Denmark	Vestas V-15	Zond	6112
Vestas Wind Systems A/S	Denmark	Vestas V-17	Zond	6112
Vestas Wind Systems A/S	Denmark	Vestas V17E	International Turbine Re	25W105
Vestas Wind Systems A/S	Denmark	Vestas V17	International Turbine Re	25W105
Vestas Wind Systems A/S	Denmark	V47	FPL Corp.	6024
Vestas Wind Systems A/S	Denmark	Vestas V39	FPL Corp.	6092
Vestas Wind Systems A/S	Denmark	V47	FPL Corp.	6092
Vestas Wind Systems A/S	Denmark	Vestas V-39 500 kW	San Gorgonio Farms, Inc.	6062
Vestas Wind Systems A/S	Denmark	Vestas V-39 500 kW	San Gorgonio Farms, Inc.	6064
Vestas Wind Systems A/S	Denmark	Vestas V-27	AB Energy	6089

## APPENDIX A (Con't)

Wincon Energy Systems	USA	Wincon 200	International Turbine Research	25W105
Wincon Energy Systems	USA	Wincon W99XT	International Turbine Research	25W105
Wincon Energy Systems	USA	Wincon 108kW	Westwind Association	6096
Wincon Energy Systems	USA	Wincon XT 110kW	Westwind Association	6096
				01W018, 01W035, 01W144, 01W146A, 01W146B, 01W146C, 01W146D, 06W146A, 06W146B, 06W146C, 06W146D,
Wind Energy Group	England	WEG-250	GreenRidge	06W146D,
Windane	Denmark	DWT Windane 34	San Gorgonio Farms, Inc.	6064
Windmatic	Denmark	Windmatic 15S	SeaWest Energy Group	6094
Windmatic	Denmark	Windmatic	SeaWest Energy Group	01W012
Windmatic	Denmark	Windmatic 17s	Southern California Sunbelt	6056
Windmatic	Denmark	Windmatic 15s	Southern California Sunbelt	6056

## APPENDIX B: SOURCES OF WIND ENERGY TECHNICAL ASSISTANCE/INFORMATION

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### *California Energy Commission:*

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George Simons  
PIER Renewables Program Manager  
Research & Development  
1516 Ninth St., MS-43  
Sacramento, CA 95814  
(916) 654-4659

Dick Anderson  
Technical Coordinator, Avian Mortality  
System Assessment & Facility Siting  
1516 Ninth St., MS-40  
Sacramento, CA 95814  
(916) 654-4166

Tim Tutt  
Renewables Energy Programs Manager  
Renewables Public Incentive Programs  
1516 Ninth St., MS-XX  
Sacramento, CA 95814  
(916) 654-4531

Tim Olson  
International Program Manager  
Energy Technology Export Program  
1516 Ninth St., MS-45  
Sacramento, CA 95814  
(916) 654-4528

News media, please contact:  
Claudia Chandler  
Assistant Director  
Media and Public Communications Office  
(916) 654-4989  
[[www.energy.ca.gov](http://www.energy.ca.gov)]

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### *National Resources:*

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Electric Power Research Institute  
(EPRI)  
Wind Power Integration  
3412 Hillview Avenue  
Palo Alto, CA 94304  
(650) 855-2121  
[[www.epri.com](http://www.epri.com)]

American Wind Energy Association  
(AWEA)  
122 C Street, NW, 4th Floor  
Washington, DC 20001  
Main: (202) 383-2500  
[[www.awea.org](http://www.awea.org)]

National Renewable Energy Laboratory  
(NREL)  
Susan Hock  
National Wind Technology Center  
1617 Cole Blvd.  
Golden, CO 80401  
(303) 384-6950  
[[www.nrel.gov](http://www.nrel.gov)]

Sandia National Laboratories  
(SNL)  
P.O. Box 5800, MS-0708  
Albuquerque, NM 87185-0708  
(505) 844-5253  
[[www.sandia.gov](http://www.sandia.gov)]

U.S. Department of Energy  
(DOE)  
Peter Goldman, Director  
Office of PV and Wind Technology  
1000 Independence Ave., SW  
Washington, DC 20585  
(202) 586-1995  
[[www.eren.doe.gov/wind](http://www.eren.doe.gov/wind)]

California Wind Energy Consortium  
(CWEC)  
Cornelis van Dam  
University of California at Davis  
One Shields Avenue  
Davis, CA 95616  
(530) 752-7741  
[[cwec.ucdavis.edu](http://cwec.ucdavis.edu)]

## APPENDIX C: REPORTING TEMPLATE

### Reporting template

Contact Person :		
Address :		
Phone # :		
E-Mail :		
QFID # :		
Wind Project Name :		
Operator Name :		

	Model 1	Model 2	Model 3
Turbine Model			
Manufacturers' Name and Address			
Cumulative number of turbines installed			
Number of turbines installed during reporting period			
Rotor (m2)			
Size (kW) at MPH			
Resource Area			
Installed Capacity (MW)			
Actual Electricity Produced, 1st quarter (kWh)			
January (kWh):			
February (kWh):			
March (kWh):			
Actual Electricity Produced, 2nd quarter (kWh)			
April (kWh):			
May (kWh):			
June (kWh):			
Actual Electricity Produced, 3rd quarter (kWh)			
July (kWh):			
August (kWh):			
September (kWh):			
Actual Electricity Produced, 4th quarter (kWh)			
October (kWh):			
November (kWh):			
December (kWh):			
Actual Annual Production (kWh)			
Power Purchaser (Utility) Name			

COMMENTS :		

### Reserved for operator comments

#	QFID	OPERATOR NAME	COMMENT
1			
2			

## **APPENDIX D: WPRS REGULATIONS**

### **REGULATIONS CALIFORNIA ADMINISTRATIVE CODE TITLE 20, CHAPTER 2, SUBCHAPTER 3, ARTICLE 4**

#### **WIND PROJECT PERFORMANCE REPORTING SYSTEM**

Adopted  
November 28, 1984

##### 1381 Title and Purpose

The purpose of this article is to specify performance reporting requirements for operators of specified wind energy projects and for entities which purchase electricity from the projects and to identify requirements for the Commission to publish the information.

*Authority cited: Sections 25213 and 25218 (e), Public Resources Code Reference: Sections 25216.5 (d), 25601 (c), and 25605, Public Resources Code.*

##### 1382 Definitions

For the purposes of this article, the following definitions shall apply unless the Commission has clearly indicated otherwise in these regulations:

- (a) “Contingency Costs”: costs which may be paid by investors after the initial investment, but which are not paid out of project revenues. Contingency costs may include such costs as turbine repairs or annual insurance fees paid during the reporting year.
- (b) “Cumulative Number of Turbines Installed”: cumulative total number of turbines of a given model installed by the end of the reporting period.
- (c) “Electricity Produced (kWh)”: total kilowatt hours actually produced by all of the turbines of a particular turbine model contained within the wind project where the electricity is delivered to a wind power purchaser for sale during the reporting period.
- (d) “Name of Wind Project”: name used for the project in any prospectus, offering memorandum, or sales literature.

- (e) “Number of Turbines Installed During Reporting Period”: number of additional turbines installed during the calendar quarter of the reporting period.

[Projected information currently not tracked. Items (f)-(h) do not apply for current report]

- (f) *“Project Cost”: total cost of the turbines installed during the reporting period. Project cost includes all debt and equity investment in the project (including non-recourse notes) and should be comparable to the project cost shown in the offering memorandum, prospectus or sales literature published by the developer.*
- (g) *“Projected Annual Production Per Turbine (kWh)”: annual average kilo-watt hour (kWh) production, by model, predicted by the developer in its prospectus, offering memorandum, or sales literature. This figure may be revised annually prior to the first reporting quarter of each year and shall be based upon average site specific wind distributions and the wind turbine power curves.*
- (h) *“Projected Quarterly Production Per Turbines (kWh)”: the quarterly breakdown of the Projected Annual Production Per Turbine.*
- (i) “Rotor (M<sup>2</sup>)”: rotor swept area in square meters for each turbine model.
- (j) “Size (kW)”: the turbine manufacturer’s published power rating in kW for a given wind speed in mile per hour (mph).
- (k) “Turbine Model”: manufacturer’s name or commonly used term for the model of a specific rotor (M<sup>2</sup>) and size (kW).
- (l) “Wind Power Purchaser”: any electricity utility or other entity that purchases electricity from a wind project, as defined in this section.
- (m) “Wind Project”: one or more wind turbine generators installed in California with a combined rated capacity of 100 kW or more, the electricity from which is sold to another party.
- (n) “Wind Project Operator”: any developer or operator who directly receives payments for electricity from the wind power purchaser.

*Authority cited: Sections 25213 and 25218 (e), Public Resources Code Reference: Sections 25216.5 (d), 25601 (c), and 25605, Public Resources Code.*

### 1383 Reporting Period

For the purpose of this article, and unless otherwise indicated, the reporting period shall be *each calendar quarter*, beginning with the first quarter following the effective date of this article. Quarterly reports filed pursuant to this article shall be submitted not later

than the *forty-fifth* day following the close of each reporting period. Reports shall be deemed submitted as of the date of postmark, provided that the report is properly and legibly completed.

*Authority cited: Sections 25213 and 25218 (e), Public Resources Code Reference: Sections 25216.5 (d), 25601 (c), and 25605, Public Resources Code.*

#### 1384 Requirements to File

The information required by this article shall be submitted to the Commission by wind project operators and wind power purchasers. Reports shall be made on forms prescribed by order of the Commission and according to instructions accompanying the forms. A copy of the wind project prospectus, offering memorandum, and other sales literature shall accompany the initial report. All reports must be verified by a responsible official of the firm filing the report. Requests for confidentiality may be filed pursuant to 20 Cal. Admin. Code section 2501 et. seq.

*Authority cited: Sections 25213 and 25218 (e), Public Resources Code Reference: Sections 25216.5 (d), 25601 (c), and 25605, Public Resources Code.*

#### 1385 Information Requirements: Wind Project Operators

Each operator firm submitting information pursuant to the provisions of the article shall include the following:

- (1) Name of wind project
- (2) Name and address of operator
- (3) Name and phone number of contact person at operator's firm
- (4) Operator's name as shown on power purchase contract (if different than 2 above)
- (5) Name of wind power purchaser
- (6) Purchase contract number
- (7) Resource area and county
- (8) Dates of reporting period
- (9) Turbine model
- (10) Cumulative number of turbines installed
- (11) Number of turbines installed during reporting period
- (12) Rotor (M<sup>2</sup>)
- (13) Size (kW) at stated wind speed
- (14) Project cost
- (15) Additional project contingency costs for which investors may be responsible
- (16) Projected quarterly production per turbine (kWh)
- (17) Projected annual production per turbine (kWh)
- (18) Electricity produced (kWh)
- (19) Turbine manufacturer's name and address

(20) Operator comments, if any

*Authority cited: Sections 25213 and 25218 (e), Public Resources Code Reference: Sections 25216.5 (d), 25601 (c), and 25605, Public Resources Code.*

1386 Information Requirement: Wind Power Purchase

Each wind power purchaser submitting information pursuant to the provisions of this article shall include the following:

- (1) Name of purchaser's firm
- (2) Name and phone number of contact person at purchasers firm
- (3) Date of report
- (4) Name of wind project operator
- (5) Number of contract with wind project operator
- (6) kWh produced during reporting period
- (7) Dates of reporting period
- (8) The maximum MW which the operator can deliver to the purchaser as specified in the power sales agreement
- (9) Purchaser comments, if any

*Authority cited: Sections 25213 and 25218 (e), Public Resources Code Reference: Sections 25216.5 (d), 25601 (c), and 25605, Public Resources Code.*

1387 Publication of Data

The Commission staff shall compile and distribute, on a quarterly basis, the information reported by wind project operators and purchasers. Cost data will be published by the Commission in an aggregated form to the extent necessary to assure confidentiality. The final publication of each year shall combine the performance data for that year. The publication shall designate the name of any wind project operator from whom performance data is not received.

*Authority cited: Sections 25213 and 25218 (e), Public Resources Code Reference: Sections 25216.5 (d), 25601 (c), and 25605, Public Resources Code.*

1388 Failure to Provide Information

The Commission may, after notifying any person of the failure to provide information pursuant to this article, take such action to secure the information as is authorized by any provision of law, including, but not limited to, Public Resources Code section 25900.

*Authority cited: Sections 25213 and 25218 (e), Public Resources Code Reference: Sections 25216.5 (d), 25601 (c), and 25605 (e), and 25900, Public Resources Code.*

1389 Exemptions

Operators of wind projects of less than 100 kW rated capacity or operators who do not offer electricity for sale are exempt from this article.

*Authority cited: Sections 25213 and 25218 (e), Public Resources Code Reference: Sections 25216.5 (d), 25601 (c), and 25605, Public Resources Cod*